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ABSTRACT

This collection of documents contains the following: (1) A Least Squares Polynomial Exponential Model for the Multiplication of Books in Sixteen Libraries; (2) Sample Letter of Agreement; (3) Instructions for Keypunching LC Numbers; (4) Estimated Times for Keypunching and Processing Data by Computer; (5) LNR Source Program Listings and Documentation; (6) System Flow Charts; Sample Output; and (7) LNR: Numerical Register of Books in Louisiana Libraries. First Computer Output Microfiche Edition. (Related materials are available as LI 004 022.) (SJ)

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LNR: Numerical Register of Books in Louisiana Libraries

Basic Documents, II

William E. McGrath

Donald J. Simon

Compiled for the Louisiana Library Association

Lafayette
Louisiana
December, 1972

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CONTENTS

5. A Least Squares Polynomial Exponential Model for the Multiplication of Books in Sixteen Libraries.

6. Sample Letter of Agreement.

7. Instructions for Keypunching LC Numbers.

8. Estimated Times for Keypunching and Processing Data by Computer.

9. LNR Source Program Listings and Documentation.

10. System Flow Charts; Sample Output.

11. LNR: Numerical Register of Books in Louisiana Libraries.
First Computer Output Microfiche Edition.

A LEAST SQUARES POLYNOMIAL EXPONENTIAL MODEL FOR THE MULTIPLICATION OF BOOKS IN SIXTEEN LIBRARIES

ABSTRACT

The authors fit a polynomial exponential model to a distribution of multiplicated titles in a system of 16 libraries. Although a linear equation fits well for transformed values of Y (i.e., multiplicated titles), when re-transformed back to the original, the linear exponential is a poor fit where the polynomial exponential is a better fit.

A LEAST SQUARES POLYNOMIAL EXPONENTIAL MODEL FOR THE MULTIPLICATION OF BOOKS IN SIXTEEN LIBRARIES

WILLIAM E. MCGRATH: Director of Libraries, DONALD SIMON: Systems Analyst and Computer Programmer, and PETER DICKINSON, Assistant Professor of Mathematics, University of Southwestern Louisiana Library, Lafayette, Louisiana.

In a previous paper[1], the authors determined that the relationship between the total number of volumes and the number of titles multiplicated in a system of 16 Louisiana libraries could be expressed by a simple linear or quadratic equation. Using a least squares anaylsis of variance procedure they determined that the fitted quadratic equation,

$$\hat{Y} = a + b_1 X + b_2 X^2,$$

where X was the total number of volumes in the system and $\hat{Y}$ was the number of multiplicated volumes, was a good fit and could be used to predict the number of multiplicated volumes for future input, but that the fitted linear equation,

$$\hat{Y} = a + bx,$$

was also a good fit and could be used with considerable confidence to predict multiplication up to ten times the magnitude of the last largest value of input.

The paper proposed that a more interesting and perhaps more reliable method would be to determine the functional or statistical distribution of titles existing in single, duplicate, triplicate etc. If such an equation could be identified it could then be used to predict multiplication

for many situations. It would presumably hold true however large the system, and whatever the system.

Method

The characteristics of the data and method of data were described in the earlier paper. Basically, each title newly cataloged by each library was matched against every other title cataloged by all the other 15 libraries. A recent cumulation was so tabulated and the data distribution appears in Table I.

Table I

Data for Title Multiplication in 16 Louisiana Libraries

Number of Libraries (X)	Total Titles (Y)	(ln Y)	$(\ln Y)^{.5}$
1	55696	10.92	3.30
2	8062	8.99	3.00
3	2224	7.71	2.78
4	671	6.51	2.55
5	240	5.48	2.34
6	69	4.23	2.05
7	36	3.58	1.89
8	12	2.48	1.58
9	8	2.08	1.44

It is obvious that the untransformed data cannot be expressed in linear terms, since the data in X and Y cannot meet the assumptions of the analysis of variance.

Several attempts to express the data in linear terms using various combinations of transformations resulted in a combination consisting of the square root of the natural logarithm for each Y as shown in Figure 1. The resulting model

$$Y = e^{(\beta_0 + \beta_1 X + \ldots + \beta_K X^K + \varepsilon)^p}$$

was then hypothesized and submitted to an analysis of variance test. The results of that test are given in Table II.

Table II

Analysis of Variance

Source of Variation	df	SS	R^2	MS	F
Linear Term	1	3.25854	.966	3.25854	2600.0000*
Quadratic Term	1	.00229	.0007	.00229	.45700
Cubic Term	1	.00004	.000012	.00004	.00798
Quartic Term	1	.00348	.00106	.00348	2.78000
Deviation about Regression	4	.00501	.0015	.00125	
Total	8	3.26937			

*Significant at $F_{(.9995,\ 1,\ 4df)}$

The linear term for this cumulation is highly significant and accounts for 96.6% of the variation. No other term is significant. Tests on earlier cumulations showed similar results, with R^2 values for the linear term up to 99.8%.

It would seem reasonable to conclude that the linear model explains the

data distribution. The fitted equation for this cumulation is

$$\hat{Y} = e^{(3.492 - .233X)^2}$$

The residuals of the transformed seem to be well within reasonable tolerances as shown in Table III.

Table III

Linear Residuals of Transformed Values

X	Transformed Y(Y′)	Predicted $\hat{Y}(\hat{Y}')$	Residual
1	3.3057	3.2591	.0466
2	2.9992	3.0261	-.0269
3	2.7762	2.7930	-.0169
4	2.5512	2.5600	-.0088
5	2.3411	2.3269	.0141
6	2.0577	2.0939	-.0362
7	1.8930	1.8608	.0322
8	1.5764	1.6278	-.0514
9	1.4420	1.3947	.0473

A plot of the residuals [redacted] reveals no discernible pattern and a runs test of the residuals indicates a probability of .929. Both tests indicate a high degree of normality.

The success of the model should be further tested by examining the residuals of the reconstructed original observations, as shown in Table IV.

Table IV

Residuals of Original Values as Re-transformed from the Transformed Predicted Values

		Linear		Quadratic		Quartic	
X	Original Y	Predicted	Residuals	Predicted	Residuals	Predicted	Residuals
1	55,696	41,017	14,679	48,198	7,497	55,512	184
2	8,062	9,483	-1,421	9,533	-1,470	8,255	-193
3	2,224	2,443	-219	2,151	73	2,134	90
4	671	702	-31	554	117	684	-13
5	240	225	15	162	77	231	9
6	69	80	-11	54	14	80	-11
7	36	32	4	21	15	30	6
8	12	14	-2	3	9	13	-1
9	8	7	1	5	3	8	

Having passed the tests of normality in transformation, it would appear that the re-transformed values of Y do not. The residuals display a rather large error and a very definite trend. It is necessary then to look at the higher degrees of the polynomial transformations, even though these terms were not significant.

It is clear from Table IV that the quartic term gives a much better fit than either the linear or quadratic terms. The residuals in the quartic are much more satisfactory. Indeed, a goodness of fit test applied to the predicted re-transformed values of Y for each term gives χ^2 values of 5,489.0 for the linear, 1,500.0 for the quadratic and 12.3 for the quartic where χ^2 (.95,8df) = 15.5.

The model

$$Y = e^{(\beta_0 + \beta_1 X + \beta_2 X^2 + \beta_3 X^3 + \beta_4 X^4 + \varepsilon)^2}$$

provides an excellent fit for the data where the fitted equation is

$$\hat{Y} = e^{(3.74084 - .52892 X + .10807 X^2 - .01557 X^3 + .00077 X^4)^2}$$

Conclusion:

It is worth noting that, even though the higher terms showed no significance in transformation, when the predicted values of the transformations ($\hat{Y}'$ linear, $\hat{Y}'$ quadratic, $\hat{Y}'$ quartic) were re-transformed to their original form, the linear and quadratic terms showed a significantly poor fit, whereas the quartic term showed an excellent fit.

Though the polynomial exponential provides an excellent fit, the author intends to search for a simpler model. A theoretical derivation of the statistical distribution is also a worthy project.

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1. Simon, D. L. and W. E. McGrath, and P. L. Dickinson. Predicting title multiplication (overlap) in a system of sixteen Louisiana libraries. Jan. 1971. (To be published, perhaps)

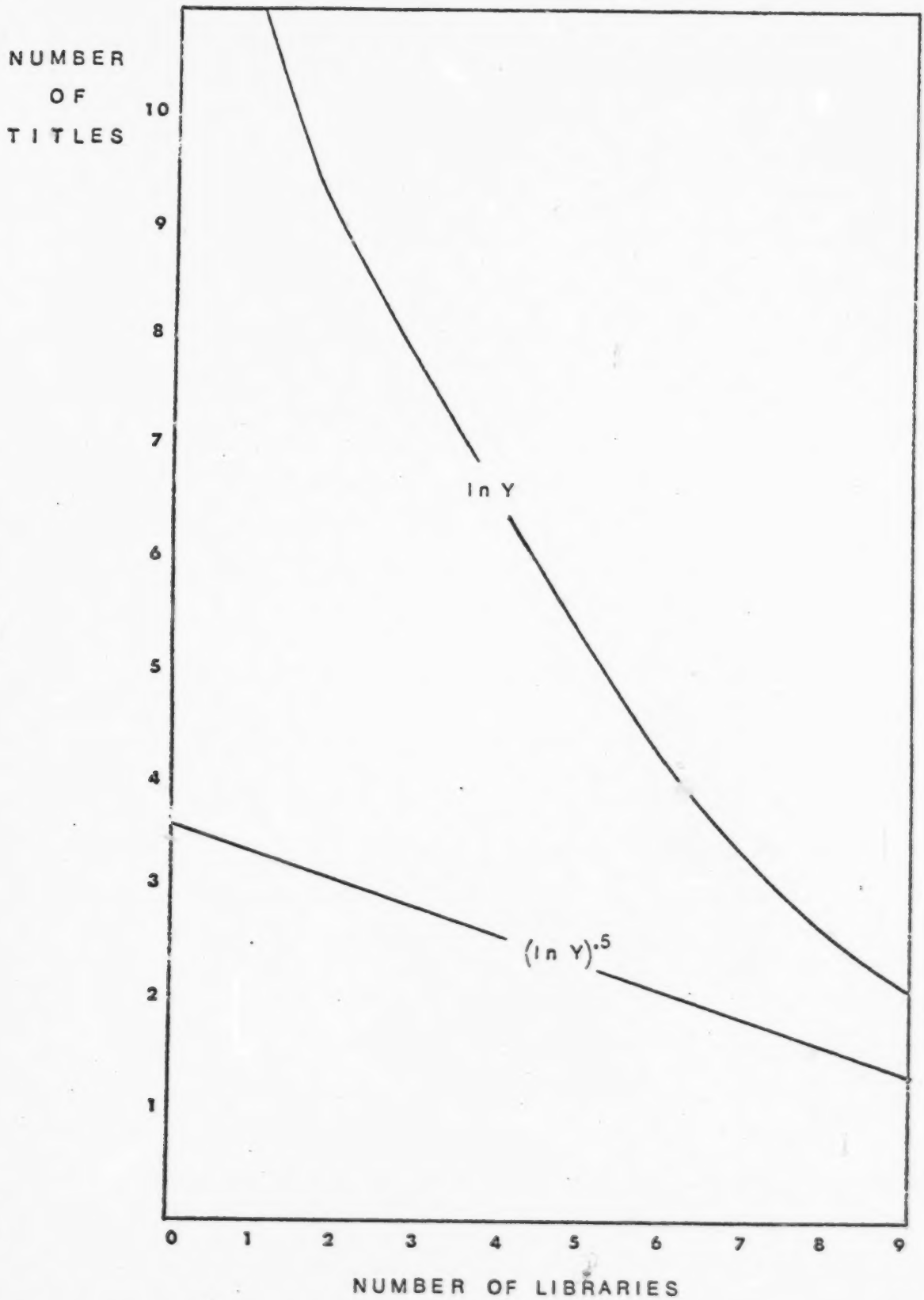


Fig.1 Plot of title distribution in natural

SAMPLE LETTER OF AGREEMENT

(Sample letter of agreement to be submitted on your letterhead)

Dear Mr. McGrath:

(Name of your institution) confirms its intent to participate, until completion, in the implementation of the project to compile a retrospective union catalog of books in Louisiana libraries based on Library of Congress card numbers, if the project is funded. It is understood that financial support will be provided for costs involved in furnishing the University of Southwestern Louisiana LC card numbers.

Card numbers for the current acquisitions will also be sent along with retrospective acquisitions.

We will agree to loan books in the catalog to other participants according to a code, if satisfactory to us, to be drawn by a committee of the participants.

Upon completion of the project, depletion of project funds, and a satisfactory demonstration of its practicality, (name of your institution) will continue to send LC card numbers, as was done during the feasibility study period prior to project funding, for regular up-dating or supplementing of the catalog.

If the project is not funded (name of your institution) (would still/would not) participate.

(signed)
Head Librarian or Director

INSTRUCTIONS FOR KEYPUNCHING LC NUMBERS

From: W. E. McGrath, Chairman

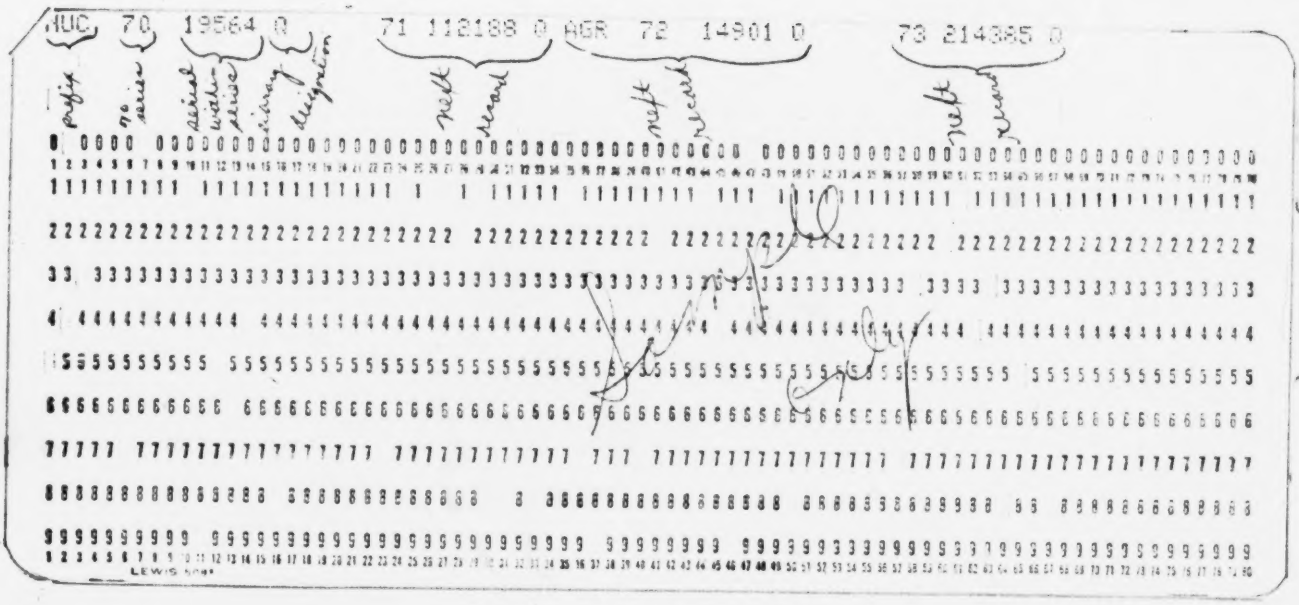
To: Prospective participants in the LC Union Catalog Project

Re: Keypunching your LC numbers

Please punch your LC numbers according to the outline below. Enclosed is a program card for your keypunch operators, and a sample data card.

	Columns	
1st LC no. on the card	1-4	Special series alphabetic characters (left justified),--e.g., NUC series
	5	Blank
	6-7	Numeric prefix (right justified)
	8	Blank
	9-14	Serial number (right justified)
	15	Blank
	16	Alphabetic character designating college
	17	Blank
2nd LC number	18-21	Special series alphabetic characters (left justified)
	22	Blank
	23-24	Numeric prefix (right justified)
	25	Blank
	26-31	Serial number (right justified)
	32	Blank
	33	Alphabetic character designating college
3rd LC number	34	Blank
	35-38	Special series alphabetic characters (left justified)
	39	Blank
	40-41	Numeric prefix (right justified)
	42	Blank
	43-48	Serial number (right justified)
	49	Blank
	50	Alphabetic character designating college
4th LC number	51	Blank
	52-55	Special series alphabetic characters (left justified)
	56	Blank
	57-58	Numeric prefix (right justified)
	59	Blank
	60-65	Serial number (right justified)
	66	Blank
	67	Alphabetic character designating college
	68-80	Blank

Do not punch suffixes (e.g., rev., †, etc.)


AUC 70 19564 0 71 112188 0 AGR 72 14901 0 73 214385 0
prefix
no. series
serial within series
check digit
next record
next record
next record

EXTIMATED TIMES FOR KEYPUNCHING AND PROCESSING DATA

BY COMPUTER

ESTIMATED TIMES FOR KEYPUNCHING AND PROCESSING DATA
BY COMPUTER

Extracting Data	varies		
Keypunching	100,000 records	100 minutes ~~80 hours~~	
Reading in Data Cards	100,000 records	60 min.	computer operations
Editing Data	100,000 records	15 min.	
Sorting Data	100,000 records	5 min.	
Merging Data	100,000 records	~~10~~ 5 min.	
Creating Out-put Tape	100,000 records	20 min.	
Print-out	100,000 records	15 min.	
	Computer Total	2 hours	

7/29/71

LNR SOURCE PROGRAM LISTINGS AND DOCUMENTATION

LNR

SOURCE PROGRAM LISTINGS

AND

DOCUMENTATION

prepared by

DONALD J. SIMON

LNR Computer Systems Analyst

for the

Louisiana Numerical Register

WILLIAM E. MCGRATH, Project Director

Dupre Library
University of Southwestern Louisiana
Lafayette, Louisiana

October 5, 1972

INTRODUCTION

The Louisiana Numerical Register is a computer-generated sequential list of Library of Congress Catalog card order numbers for books held in Louisiana libraries. The first edition was offset printed and distributed in 1971. It contained locations for 548,290 copies of 346,299 titles (1.6 copies per title) in sixteen libraries. The second edition contains locations for 1,106,334 copies of 560,413 titles in twenty-one libraries, and has been programmed for computer output microfiche (COM) and will be distributed in that form.

The Louisiana Numerical Register is a state-wide project conducted by a committee of the Louisiana Library Association*. Support for this project was provided by funds from an LSCA grant administered by the Louisiana State Library under Sallie Farrell, State Librarian.

Sample printouts of the LNR programs are shown in the appendices.

The following documentations contains seven COBOL programs for the LNR System. The COM program is owned by a commercial firm and is not included here.

The LNR programs may be used by non-profit making institutions without charge as long as due credit is given to the authors and the LNR system and as long as the products are not commercially sold.

Donald J. Simon

William E. McGrath

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* Chairman, 1971-72, Mr. Sam Dyson, Director of Libraries, Louisiana Tech University, Ruston, La.

Users of the LNR programs are required to sign the following statement:

I, the undersigned, agree that I will not sell nor turn over to other parties any of the LNR computer programs.

Name_____

Title_____

Institution_____

Date_____

The LNR System is comprised of the following programs:

LNRRD
LNRUPD
LNREDT
LNRSRT
LNRSTP
LNRLST
LNRTAB

LNRRD - This program is used to transfer card data (as shown on card record layout) to magnetic tape (LNR data tape). The tape records are simply images of the card records and are blocked 400 records per block.

The program requires a card reader and one tape drive.

The record layout of a tape record on the LNR data tape after this program is run is as follows:

Col.	1-4	Special series alphabetic prefix
	5	Blank
	6-7	Numeric prefix
	8	Blank
	9-14	Serial number
	15	Blank
	16	Location code (A - Z)
	17	Blank

The total number of card records read in will be displayed on printer.

* Console Messages and Replies:

MSG-	ASSGN SYSIPT
REPLY-	(assign reader)
MSG-	ASSGN SYS101
REPLY-	(assign LNR data tape)

* Console messages and replies for all programs in this system or as they appear on the UNIVAC COMPUTER at the University of Southwestern Louisiana. These may be quite different on other computers.

LNRUPD - This program is used to add card data to the LNR data tape. The program performs the following in the indicated sequence:
1. Card data is read onto the work tape.
2. LNR data tape is read onto work tape.
3. Work tape is then copied back to LNR data tape.

The program requires two tape drives (one for the work tape and one for the LNR data tape), and a card reader.

Console Messages and Replies:

MSG-	ASSGN SYSIPT
REPLY-	(assign reader)
MSG-	ASSGN SYS101
REPLY-	(assign work tape)
MSG-	ASSGN SYS102
REPLY-	(assign LNR data tape)

The following record counts are displayed upon printer:
1. Number of card records read in.
2. Number of tape records previously on LNR data tape.
3. Total number of records on LNR data tape after run completed.

LNREDT - This program edits all data fields of records on the LNR data tape. Bad records are displayed on the printer for examination prior to re-punching on cards. Acceptable records are recorded on the work tape with 4 blank fields removed. The original record contained 17 characters including 4 blank characters -- the edited record contains 13 characters.

A count of the original, un-edited records and a count of the edited acceptable records is displayed on the console. The work tape containing the edited records is then copied back onto the LNR data tape via a utility program. (At installations where utility programs for simply duplicating one tape onto another do not exist, a small COBOL program to accomplish this task could be written).

The program requires two tape drives.
The record layout of records on the LNR data tape after execution of the above is as follows:

Col.	1-4	Special series alphabetic prefix
	5-6	Numeric prefix
	7-12	Serial number
	13	Location code (A - Z)

Console Messages and Replies:

MSG-	ASSGN SYS101
REPLY-	(assign LNR data tape)
MSG-	ASSGN SYS102
REPLY-	(assign work tape)

```
    1          IDENTIFICATION DIVISION.
    2          PROGRAM-ID. 'LNRRD'.
    3          ENVIRONMENT DIVISION.
    4          INPUT-OUTPUT SECTION.
    5          FILE-CONTROL.
    6              SELECT CRDFL ASSIGN TO SYSIPT
    7              RESERVE NO ALTERNATE AREA.
    8              SELECT INTAP ASSIGN TO 'SYS101' UTILITY M70-432.
    9          DATA DIVISION.
   10          FILE SECTION.
   11          FD   CRDFL RECORDING MODE IS F LABEL RECORDS
   12               ARE OMITTED DATA RECORD IS CARD-REC.
   13          01   CARD-REC.
   14               02  CARD2  PICTURE X(17) OCCURS 4 TIMES.
   15               02  FILLER  PICTURE X(12).
   16          FD   INTAP RECORDING MODE IS F LABEL RECORDS ARE
   17               OMITTED BLOCK CONTAINS 400 RECORDS
   18               DATA RECORD IS TAPE-REC.
   19          01   TAPE-REC  PICTURE X(17).
   20          WORKING-STORAGE SECTION.
   21          77   KOUNT                PICTURE 9(6) VALUE 0.
   22          77   IND  PICTURE 9.
   23          PROCEDURE DIVISION.
   24               OPEN INPUT CRDFL OUTPUT INTAP MOVE 1 TO IND.
   25          RD-FIL.
   26               READ CRDFL AT END GO TO FINI.
   27          MOV-REC.
   28               MOVE CARD2 (IND) TO TAPE-REC WRITE TAPE-REC ADD 1 TO IND.
   29               ADD 1 TO KOUNT.
   30               IF IND > 4 MOVE 1 TO IND GO TO RD-FIL. GO TO MOV-REC.
   31          FINI.
   32               DISPLAY 'TOTAL RECORDS  =  ' KOUNT.
   33               CLOSE CRDFL INTAP STOP RUN.
```

```
IDENTIFICATION DIVISION.
PROGRAM-ID. 'LNRUPD'.
ENVIRONMENT DIVISION.
INPUT-OUTPUT SECTION.
FILE-CONTROL.
    SELECT CRDFL ASSIGN TO SYSIPT
    RESERVE NO ALTERNATE AREA.
    SELECT TRANS ASSIGN TO 'SYS101' UTILITY M70-432.
    SELECT OLTAP ASSIGN TO 'SYS102' UTILITY M70-432.
DATA DIVISION.
FILE SECTION.
FD  CRDFL RECORDING MODE IS F LABEL RECORDS ARE
    OMITTED DATA RECORD IS CARD-REC.
01  CARD-REC.
    02  CARD2       PICTURE X(17) OCCURS 4 TIMES.
    02  FILLER      PICTURE X(12).
FD  TRANS RECORDING MODE IS F LABEL RECORDS ARE
    OMITTED BLOCK CONTAINS 400 RECORDS
    DATA RECORD IS TRANS-REC.
01  TRANS-REC  PICTURE X(17).
FD  OLTAP RECORDING MODE IS F LABEL RECORDS ARE
    OMITTED BLOCK CONTAINS 400 RECORDS
    DATA RECORD IS OL-REC.
01  OL-REC  PICTURE X(17).
WORKING-STORAGE SECTION.
77  CRD-KNT          PICTURE 9(6) VALUE 0.
77  TAP-KNT          PICTURE 9(6) VALUE 0.
77  TOT-KNT          PICTURE 9(6) VALUE 0.
77  INC              PICTURE 9.
PROCEDURE DIVISION.
    OPEN INPUT CRDFL OUTPUT TRANS MOVE 1 TO INC.
PAR-1.
    READ CRDFL AT END GO TO PAR-2.
MOV-REC.
    MOVE CARD2 (INC) TO TRANS-REC WRITE TRANS-REC ADD 1 TO INC.
    ADD 1 TO CRD-KNT ADD 1 TO TOT-KNT.
    IF INC > 4 MOVE 1 TO INC GO TO PAR-1. GO TO MOV-REC.
PAR-2.
    CLOSE CRDFL OPEN INPUT OLTAP.
PAR-3.
    READ OLTAP AT END GO TO PAR-4.
    ADD 1 TO TAP-KNT ADD 1 TO TOT-KNT.
    MOVE OL-REC TO TRANS-REC WRITE TRANS-REC GO TO PAR-3.
PAR-4.
    CLOSE OLTAP TRANS.
    OPEN INPUT TRANS OUTPUT OLTAP.
PAR-5.
    READ TRANS AT END GO TO FINI.
    MOVE TRANS-REC TO OL-REC WRITE OL-REC GO TO PAR-5.
FINI.
    DISPLAY 'CARD RECORDS  =  ' CRD-KNT.
```

```
52              DISPLAY 'TAPE RECORDS  =  ' TAP-KNT.
53              DISPLAY 'TOT-KNT       =  ' TOT-KNT.
54              CLOSE TRANS OLTAP STOP RUN.
```

```
    1          IDENTIFICATION DIVISION.
    2          PROGRAM-ID. 'LNREDT'.
    3          ENVIRONMENT DIVISION.
    4          INPUT-OUTPUT SECTION.
    5          FILE-CONTROL.
    6              SELECT TRANS-TAPE ASSIGN TO 'SYS101' UTILITY M70-432.
    7              SELECT NEW-TAPE ASSIGN TO 'SYS102' UTILITY M70-432.
    8          DATA DIVISION.
    9          FILE SECTION.
   10          FD  TRANS-TAPE
   11              RECORDING MODE IS F
   12              LABEL RECORDS ARE OMITTED
   13              BLOCK CONTAINS 400 RECORDS
   14              DATA RECORD IS TRANS-REC.
   15          01  TRANS-REC.
   16              02  ALPH1          PICTURE X(4).
   17              02  FIL1           PICTURE X.
   18              02  NUM1           PICTURE XX.
   19              02  FIL2           PICTURE X.
   20              02  MAIN1          PICTURE X(6).
   21              02  FIL3           PICTURE X.
   22              02  COLL1          PICTURE X.
   23              02  FIL4           PICTURE X.
   24          FD  NEW-TAPE
   25              RECORDING MODE IS F
   26              LABEL RECORDS ARE OMITTED
   27              BLOCK CONTAINS 400 RECORDS
   28              DATA RECORD IS NEW-REC.
   29          01  NEW-REC.
   30              02  NEW-ALPH       PICTURE X(4).
   31              02  NEW-NUM        PICTURE XX.
   32              02  NEW-MAIN       PICTURE X(6).
   33              02  NEW-COLL       PICTURE X.
   34          WORKING-STORAGE SECTION.
   35          77  IN-KNT             PICTURE 9(6) VALUE 0.
   36          77  OUT-KNT            PICTURE 9(6) VALUE 0.
   37          77  IND                PICTURE S99 USAGE COMPUTATIONAL.
   38          77  INC                PICTURE S99 USAGE COMPUTATIONAL.
   39          01  ALPH-RA.
   40              02  ALP            PICTURE X OCCURS 4 TIMES.
   41          01  ALPH-HLD.
   42              02  ALF            PICTURE X OCCURS 4 TIMES.
   43          01  MACH-RA.
   44              02  MACH-2A.
   45                  03  FILLER     PICTURE XX VALUE 'AC'.
   46                  03  FILLER     PICTURE XX VALUE 'AF'.
   47                  03  FILLER     PICTURE XX VALUE 'AG'.
   48                  03  FILLER     PICTURE XX VALUE 'BS'.
   49                  03  FILLER     PICTURE XX VALUE 'CA'.
   50                  03  FILLER     PICTURE XX VALUE 'CD'.
   51                  03  FILLER     PICTURE XX VALUE 'CS'.
```

```
                03  FILLER      PICTURE XX VALUE 'CX'.
                03  FILLER      PICTURE XX VALUE 'DO'.
                03  FILLER      PICTURE XX VALUE 'ES'.
                03  FILLER      PICTURE XX VALUE 'FI'.
                03  FILLER      PICTURE XX VALUE 'GS'.
                03  FILLER      PICTURE XX VALUE 'HA'.
                03  FILLER      PICTURE XX VALUE 'HE'.
                03  FILLER      PICTURE XX VALUE 'JA'.
                03  FILLER      PICTURE XX VALUE 'JX'.
                03  FILLER      PICTURE XX VALUE 'KX'.
                03  FILLER      PICTURE XX VALUE 'MA'.
                03  FILLER      PICTURE XX VALUE 'LC'.
                03  FILLER      PICTURE XX VALUE 'MS'.
                03  FILLER      PICTURE XX VALUE 'NE'.
                03  FILLER      PICTURE XX VALUE 'NO'.
                03  FILLER      PICTURE XX VALUE 'PA'.
                03  FILLER      PICTURE XX VALUE 'PO'.
                03  FILLER      PICTURE XX VALUE 'PS'.
                03  FILLER      PICTURE XX VALUE 'RA'.
                03  FILLER      PICTURE XX VALUE 'SA'.
                03  FILLER      PICTURE XX VALUE 'SO'.
                03  FILLER      PICTURE XX VALUE 'SG'.
                03  FILLER      PICTURE XX VALUE 'SS'.
                03  FILLER      PICTURE XX VALUE 'RC'.
            02  MACH-2 REDEFINES MACH-2A PICTURE XX OCCURS 31 TIMES.
            02  MACH-3A.
                03  FILLER      PICTURE XXX VALUE 'AGR'.
                03  FILLER      PICTURE XXX VALUE 'FIA'.
                03  FILLER      PICTURE XXX VALUE 'FIE'.
                03  FILLER      PICTURE XXX VALUE 'HEW'.
                03  FILLER      PICTURE XXX VALUE 'HEX'.
                03  FILLER      PICTURE XXX VALUE 'INT'.
                03  FILLER      PICTURE XXX VALUE 'MAP'.
                03  FILLER      PICTURE XXX VALUE 'MED'.
                03  FILLER      PICTURE XXX VALUE 'MIC'.
                03  FILLER      PICTURE XXX VALUE 'MPA'.
                03  FILLER      PICTURE XXX VALUE 'NEX'.
                03  FILLER      PICTURE XXX VALUE 'NUC'.
                03  FILLER      PICTURE XXX VALUE 'PHO'.
                03  FILLER      PICTURE XXX VALUE 'REV'.
                03  FILLER      PICTURE XXX VALUE 'SAX'.
                03  FILLER      PICTURE XXX VALUE 'WAR'.
            02  MACH-3 REDEFINES MACH-3A PICTURE XXX OCCURS 16 TIMES.
            02  MACH-4A.
                03  FILLER      PICTURE X VALUE 'A'.
                03  FILLER      PICTURE X VALUE 'B'.
                03  FILLER      PICTURE X VALUE 'C'.
                03  FILLER      PICTURE X VALUE 'D'.
                03  FILLER      PICTURE X VALUE 'E'.
                03  FILLER      PICTURE X VALUE 'F'.
                03  FILLER      PICTURE X VALUE 'G'.
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103                 03  FILLER         PICTURE X VALUE 'H'.
104                 03  FILLER         PICTURE X VALUE 'I'.
105                 03  FILLER         PICTURE X VALUE 'J'.
106                 03  FILLER         PICTURE X VALUE 'K'.
107                 03  FILLER         PICTURE X VALUE 'L'.
108                 03  FILLER         PICTURE X VALUE 'M'.
109                 03  FILLER         PICTURE X VALUE 'N'.
110                 03  FILLER         PICTURE X VALUE 'O'.
111                 03  FILLER         PICTURE X VALUE 'P'.
112                 03  FILLER         PICTURE X VALUE 'Q'.
113                 03  FILLER         PICTURE X VALUE 'R'.
114                 03  FILLER         PICTURE X VALUE 'S'.
115                 03  FILLER         PICTURE X VALUE 'T'.
116                 03  FILLER         PICTURE X VALUE 'U'.
117                 03  FILLER         PICTURE X VALUE 'V'.
118                 03  FILLER         PICTURE X VALUE 'W'.
119                 03  FILLER         PICTURE X VALUE 'X'.
120                 03  FILLER         PICTURE X VALUE 'Y'.
121                 03  FILLER         PICTURE X VALUE 'Z'.
122                 02  MACH-4 REDEFINES MACH-4A PICTURE X OCCURS 26 TIMES.
123             PROCEDURE DIVISION.
124                 OPEN INPUT TRANS-TAPE OUTPUT NEW-TAPE.
125             SWCHR.
126                 READ TRANS-TAPE AT END GO TO CLOS-2.  ADD 1 TO IN-KNT.
127                 IF FIL1 NOT EQUAL TO ' ' OR FIL2 NOT EQUAL TO ' ' OR FIL3
128                 NOT EQUAL TO ' ' OR FIL4 NOT EQUAL TO ' ' GO TO DISP.
129                 IF ALPH1 NOT ALPHABETIC OR COLL1 NOT ALPHABETIC GO TO
130                 DISP. IF COLL1 = ' ' GO TO DISP.
131                 GO TO CHK-CODR.
132             SWCHR-A.
133                 EXAMINE NUM1 REPLACING LEADING SPACES BY ZEROES.
134                 EXAMINE MAIN1 REPLACING LEADING SPACES BY ZEROES.
135                 IF NUM1 NOT NUMERIC GO TO DISP.
136                 IF MAIN1 NOT NUMERIC GO TO DISP.
137                 IF MAIN1 = ALL '0' GO TO DISP.
138                 MOVE SPACES TO NEW-REC.
139                 IF ALPH1 = 'MARC' MOVE SPACES TO ALPH1 GO TO STEP-2.
140                 IF ALPH1 IS NOT EQUAL TO '    ' GO TO CHK-1.
141             STEP-2.
142                 EXAMINE NUM1 REPLACING LEADING ZEROES BY SPACES.
143                 EXAMINE MAIN1 REPLACING LEADING ZEROES BY SPACES.
144                 MOVE ALPH1 TO NEW-ALPH MOVE NUM1 TO NEW-NUM MOVE MAIN1
145                 TO NEW-MAIN MOVE COLL1 TO NEW-COLL WRITE NEW-REC
146                 ADD 1 TO OUT-KNT GO TO SWCHR.
147             CHK-1.
148                 MOVE 1 TO IND MOVE 1 TO INC
149                 MOVE SPACES TO ALPH-RA MOVE SPACES TO ALPH-HLD.
150                 MOVE ALPH1 TO ALPH-RA.
151             CHK-2.
152                 IF ALP (IND) IS NOT EQUAL TO ' ' GO TO CHK-3.
153                 ADD 1 TO IND. IF IND > 4 GO TO CHK-POS. GO TO CHK-2.
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154             CHK-3.
155                 MOVE ALP (IND) TO ALF (INC) ADD 1 TO IND ADD 1 TO INC.
156                 IF IND > 4 GO TO CHK-POS. GO TO CHK-2.
157             CHK-POS.
158                 IF ALF (2) = ! ! MOVE ALPH-HLD TO ALPH1 GO TO STEP-2.
159                 IF ALF (3) = ! ! MOVE 1 TO IND GO TO POS-2.
160                 IF ALF (4) = ! ! MOVE 1 TO IND GO TO POS-3.
161                 MOVE ALPH-HLD TO ALPH1 GO TO STEP-2.
162             POS-2.
163                 IF ALPH-HLD = MACH-2 (IND) MOVE ALPH-HLD TO ALPH1
164                 GO TO STEP-2. ADD 1 TO IND. IF IND > 31
165                 DISPLAY TRANS-REC GO TO SWCHR. GO TO POS-2.
166             POS-3.
167                 IF ALPH-HLD = MACH-3 (IND) MOVE ALPH-HLD TO ALPH1
168                 GO TO STEP-2. ADD 1 TO IND. IF IND > 16
169                 DISPLAY TRANS-REC GO TO SWCHR. GO TO POS-3.
170             DISP.
171                 DISPLAY TRANS-REC GO TO SWCHR.
172             CHK-CODE.
173                 MOVE 1 TO IND.
174             POOL-1.
175                 IF COLL1 = MACH-4 (IND) GO TO SWCHR-A.
176                 ADD 1 TO IND. IF IND > 26 DISPLAY TRANS-REC GO TO SWCHR.
177                 GO TO POOL-1.
178             CLOS-2.
179                 DISPLAY !OLD RECORD COUNT = ! IN-KNT UPON CONSOLE.
180                 DISPLAY !NEW RECORD COUNT = ! OUT-KNT UPON CONSOLE.
181                 CLOSE NEW-TAPE TRANS-TAPE STOP RUN.
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1          IDENTIFICATION DIVISION.
2          PROGRAM-ID. 'LNRSRT'.
3          ENVIRONMENT DIVISION.
4          INPUT-OUTPUT SECTION.
5          FILE-CONTROL.
6              SELECT LNRTAP ASSIGN TO 'SYS100' UTILITY M70-445.
7              SELECT SRTFIL ASSIGN TO 3 TAPES.
8          DATA DIVISION.
9          FILE SECTION.
10         FD   LNRTAP RECORDING MODE IS F
11             LABEL RECORDS ARE OMITTED
12             BLOCK CONTAINS 400 RECORDS
13             DATA RECORD IS LNR-REC.
14         01   LNR-REC                PICTURE X(13).
15         SD   SRTFIL RECORDING MODE IS F
16             LABEL RECORDS ARE OMITTED
17             DATA RECORD IS SRT-REC.
18         01   SRT-REC.
19              02  SRT-ALPH.    PICTURE X(4).
20              02  SRT-NUM      PICTURE XX.
21              02  SRT-MAIN     PICTURE X(6).
22              02  SRT-COLG     PICTURE X.
23         PROCEDURE DIVISION.
24             SORT SRTFIL ASCENDING SRT-NUM ASCENDING SRT-ALPH
25             ASCENDING SRT-MAIN ASCENDING SRT-COLG
26             USING LNRTAP GIVING LNRTAP.          STOP RUN.
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1          IDENTIFICATION DIVISION.
2          PROGRAM-ID. 'LNRSTP'.
3          ENVIRONMENT DIVISION.
4          INPUT-OUTPUT SECTION.
5          FILE-CONTROL.
6              SELECT INTAP ASSIGN TO 'SYS101' UTILITY M70-432.
7              SELECT OUTAP ASSIGN TO 'SYS102' UTILITY M70-432.
8          DATA DIVISION.
9          FILE SECTION.
10         FD  INTAP RECORDING MODE IS F LABEL RECORDS ARE
11             OMITTED BLOCK CONTAINS 400 RECORDS
12             DATA RECORD IS IN-REC.
13         01  IN-REC                  PICTURE X(13).
14         FD  OUTAP RECORDING MODE IS F LABEL RECORDS ARE
15             OMITTED BLOCK CONTAINS 400 RECORDS
16             DATA RECORD IS OUT-REC.
17         01  OUT-REC                 PICTURE X(13).
18         WORKING-STORAGE SECTION.
19         77  IN-KNT                  PICTURE 9(6) VALUE 0.
20         77  OUT-KNT                 PICTURE 9(6) VALUE 0.
21         01  RECORD.
22             02  REC-HLD             PICTURE X(13).
23         PROCEDURE DIVISION.
24             OPEN INPUT INTAP OUTPUT OUTAP.
25         PAR-1.
26             READ INTAP AT END GO TO PAR-3. ADD 1 TO IN-KNT.
27             MOVE IN-REC TO REC-HLD.
28         PAR-2.
29             READ INTAP AT END GO TO PAR-3. ADD 1 TO IN-KNT.
30             IF IN-REC = REC-HLD GO TO PAR-2.
31             MOVE REC-HLD TO OUT-REC WRITE OUT-REC.
32             MOVE IN-REC TO REC-HLD GO TO PAR-2.
33         PAR-3.
34             MOVE REC-HLD TO OUT-REC WRITE OUT-REC.
35             CLOSE INTAP OUTAP. OPEN INPUT OUTAP OUTPUT INTAP.
36         PAR-4.
37             READ OUTAP AT END GO TO FINI. ADD 1 TO OUT-KNT.
38             MOVE OUT-REC TO IN-REC WRITE IN-REC GO TO PAR-4.
39         FINI.
40             DISPLAY 'OLD RECORD COUNT = ' IN-KNT UPON CONSOLE.
41             DISPLAY 'NEW RECORD COUNT = ' OUT-KNT UPON CONSOLE.
42             CLOSE INTAP OUTAP STOP RUN.
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1           IDENTIFICATION DIVISION.
2           PROGRAM-ID. 'LNRLST'.
3           ENVIRONMENT DIVISION.
4           INPUT-OUTPUT SECTION.
5           FILE-CONTROL.
6               SELECT LNRTAP ASSIGN TO 'SYS101' UTILITY M70-445.
7               SELECT MRGTAP ASSIGN TO 'SYS102' UTILITY M70-445.
8               SELECT PRINT-FILE ASSIGN TO SYSLST RESERVE NO.
9           DATA DIVISION.
10          FILE SECTION.
11          FD  LNRTAP
12              RECORDING MODE IS F
13              BLOCK CONTAINS 400 RECORDS
14              LABEL RECORDS ARE OMITTED
15              DATA RECORD IS LNR-REC.
16          01  LNR-REC.
17              02  IN-CHK.
18                  03  ALPH5          PICTURE X(4).
19                  03  NUM5           PICTURE 99.
20                  03  MAIN5          PICTURE 9(6).
21              02  COLL5          PICTURE X.
22          FD  MRGTAP
23              RECORDING MODE IS F
24              BLOCK CONTAINS 400 RECORDS
25              LABEL RECORDS ARE OMITTED
26              DATA RECORD IS MRG-REC.
27          01  MRG-REC.
28              02  ALPH2          PICTURE X(4).
29              02  NUM2           PICTURE 99.
30              02  NUM3     PICTURE XX REDEFINES NUM2.
31              02  MAIN2          PICTURE 9(6).
32              02  COLL2          PICTURE X(20).
33          FD  PRINT-FILE
34              RECORDING MODE IS U
35              LABEL RECORDS ARE OMITTED
36              DATA RECORDS ARE PRINT-REC PRINT-REC4 PRINT-REC5.
37          01  PRINT-REC.
38              02  CC1            PICTURE X.
39              02  PRNT-RC        PICTURE X(13) OCCURS 10 TIMES.
40              02  FILLER         PICTURE XX.
41          01  PRINT-REC4.
42              02  CC2            PICTURE X.
43              02  FILLER         PICTURE X(120).
44              02  PAG-HLD        PICTURE X(5).
45              02  PAG-PRT        PICTURE ZZZZ.
46              02  FILLER         PICTURE XXX.
47          01  PRINT-REC5.
48              02  CC3            PICTURE X.
49              02  FILLER         PICTURE XX.
50              02  PAG-HLDB       PICTURE X(5).
51              02  PAG-PRTB       PICTURE ZZZZ.
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52                02  FILLER          PICTURE X(121).
53            WORKING-STORAGE SECTION.
54            77  LNRKNT              PICTURE 9(8) VALUE 0.
55            77  PRGKNT              PICTURE 9(8) VALUE 0.
56            77  IND                 PICTURE 9(6) VALUE 1.
57            77  INC                 PICTURE 9(6) VALUE 1.
58            77  AN1                 PICTURE 99 VALUE 0.
59            77  AN2                 PICTURE 99 VALUE 0.
60            77  SWCH                PICTURE 9 VALUE 0.
61            77  SWCH-PT             PICTURE 9 VALUE 0.
62            77  ALPHSAV             PICTURE X(4).
63            77  PAG-KNT             PICTURE 9(4) VALUE 0.
64            77  NUMSAV              PICTURE XX.
65            77  PAG-SWCH            PICTURE 9.
66            77  CNTRL-NU            PICTURE X.
67            01  COL-ARAY.
68                02  COLL4           PICTURE X OCCURS 20 TIMES.
69            01  COL-XR.
70                02  XR-ONE.
71                    03  XR1         PICTURE X OCCURS 5 TIMES.
72                02  XR-TWO.
73                    03  XR2         PICTURE X OCCURS 5 TIMES.
74                02  XR-THREE.
75                    03  XR3         PICTURE X OCCURS 5 TIMES.
76                02  XR-FOUR.
77                    03  XR4         PICTURE X OCCURS 5 TIMES.
78            01  CHK-ARA1.
79                02  CHK-ALPH1       PICTURE X(4).
80                02  CHK-NUM1        PICTURE 99.
81                02  CHK-MAIN1       PICTURE 9(6).
82            01  CHK-ARA2.
83                02  CH-ALPH2        PICTURE X(4).
84                02  CHK-NUM2        PICTURE 99.
85                02  CHK-MAIN2       PICTURE 9(6).
86            01  PRNT-ARA.
87                02  PRNT-1          PICTURE X(13) OCCURS 60 TIMES.
88                02  PRNT-2          PICTURE X(13) OCCURS 60 TIMES.
89                02  PRNT-3          PICTURE X(13) OCCURS 60 TIMES.
90                02  PRNT-4          PICTURE X(13) OCCURS 60 TIMES.
91                02  PRNT-5          PICTURE X(13) OCCURS 60 TIMES.
92                02  PRNT-6          PICTURE X(13) OCCURS 60 TIMES.
93                02  PRNT-7          PICTURE X(13) OCCURS 60 TIMES.
94                02  PRNT-8          PICTURE X(13) OCCURS 60 TIMES.
95                02  PRNT-9          PICTURE X(13) OCCURS 60 TIMES.
96                02  PRNT-10         PICTURE X(13) OCCURS 60 TIMES.
97            01  HD-STOR.
98                02  FILLER          PICTURE XXX.
99                02  HD-ALPH         PICTURE X(4).
100               02  HD-NUM          PICTURE 99.
101               02  FILLER          PICTURE XXX.
102           01  NUM-STOR.
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103                 02  MAIN-STOR    PICTURE 9(6).
104                 02  FILLER       PICTURE X.
105                 02  COLL-STOR    PICTURE X(5).
106             PROCEDURE DIVISION.
107                 OPEN INPUT LNRTAP OUTPUT MRGTAP.
108             MRG-EM.
109                 READ LNRTAP AT END GO TO PRNT-HEAD. ADD 1 TO LNRKNT.
110                 MOVE SPACES TO CHK-ARA1 MOVE IN-CHK TO CHK-ARA1 MOVE SPACES
111                 TO COL-ARAY MOVE COLL5 TO COLL4 (IND) ADD 1 TO IND.
112             MRG-2.
113                 READ LNRTAP AT END GO TO PRNT-HEAD. ADD 1 TO LNRKNT.
114                 MOVE SPACES TO CHK-ARA2 MOVE IN-CHK TO CHK-ARA2.
115                 IF CHK-ARA1 = CHK-ARA2 GO TO MRG-22A.
116                 MOVE CHK-ARA1 TO MRG-REC MOVE COL-ARAY
117                 TO COLL2 WRITE MRG-REC ADD 1 TO MRGKNT.
118                 MOVE CHK-ARA2 TO CHK-ARA1 MOVE 1 TO IND MOVE SPACES TO
119                 COL-ARAY MOVE COLL5 TO COLL4 (IND)
120                 ADD 1 TO IND GO TO MRG-2.
121             MRG-22A.
122                 COMPUTE INC = IND - 1. IF COLL5 = COLL4 (INC) GO TO MRG-2.
123                 MOVE COLL5 TO COLL4 (IND) ADD 1 TO IND GO TO MRG-2.
124             PRNT-HEAD.
125                 MOVE CHK-ARA1 TO MRG-REC MOVE COL-ARAY TO COLL2
126                 WRITE MRG-REC ADD 1 TO MRGKNT CLOSE LNRTAP.
127                 DISPLAY 'MOUNT NEXT REEL -(REPLY Y OR N)' UPON CONSOLE.
128                 ACCEPT CNTRL-NO FROM CONSOLE.
129                 IF CNTRL-NO = 'Y' OPEN INPUT LNRTAP GO TO MRG-2.
130                 DISPLAY 'TOTAL RECORDS  =  ' LNRKNT UPON CONSOLE.
131                 DISPLAY 'TOTAL MERGED RECORDS  =  ' MRGKNT UPON CONSOLE.
132                 CLOSE MRGTAP.
133             MOUNT-MRG.
134                 DISPLAY 'MOUNT 1ST MERGED REEL -(REPLY Y OR N)' UPON CONSOLE.
135                 ACCEPT CNTRL-NO FROM CONSOLE.
136                 IF CNTRL-NO = 'Y' NEXT SENTENCE ELSE GO TO MOUNT-MRG.
137                 OPEN INPUT MRGTAP OUTPUT PRINT-FILE.
138                 MOVE SPACES TO PRINT-REC ADD 1 TO PAG-KNT MOVE PAG-KNT
139                 TO PAG-PRT MOVE 'PAGE ' TO PAG-HLD
140                 WRITE PRINT-REC4 AFTER ADVANCING 0 LINES MOVE SPACES
141                 TO PRINT-REC WRITE PRINT-REC AFTER ADVANCING 1 LINES
142                 MOVE 1 TO PAG-SWCH.
143             RD-TAP.
144                 READ MRGTAP AT END PERFORM PRNT-RTN2.
145                 MOVE ALPH2 TO ALPHSAV MOVE NUM2 TO NUMSAV
146                 MOVE SPACES TO PRNT-ARA MOVE 1 TO IND.
147                 MOVE SPACES TO NUM-STOR.
148                 MOVE 0 TO SWCH MOVE 0 TO SWCH-PT.
149             HEAD-IT.
150                 MOVE SPACES TO HD-STOR MOVE ALPH2 TO HD-ALPH MOVE NUM2 TO
151                 HD-NUM.
152             MOVE-1.
153                 MOVE HD-STOR TO PRNT-1 (IND) .
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154                 ADD 2 TO IND.
155                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
156             SEC-1.
157                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S1-PT3.
158                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S1-PT4.
159                 IF SWCH > 1 GO TO S1-PT2.
160                 READ MRGTAP AT END PERFORM PRNT-RTN2.
161                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
162                 NUMSAV GO TO SEC-1A1.
163                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
164                 GO TO SEC-1A.
165             SEC-1A1.
166                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
167                 GO TO SEC-22. GO TO SEC-11.
168             SEC-1A.
169                 MOVE XR-ONE TO COLL-STOR.
170                 MOVE NUM-STOR TO PRNT-1 (IND) ADD 1 TO IND.
171                 IF IND > 60 MOVE 1 TO IND GO TO SEC-2.  GO TO SEC-1.
172             S1-PT2.
173                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
174                 MOVE NUM-STOR TO PRNT-1 (IND) ADD 1 TO IND.
175                 IF SWCH > 2 GO TO S1-PT3. MOVE 0 TO SWCH.
176                 IF IND > 60 MOVE 1 TO IND GO TO SEC-2. GO TO SEC-1.
177             S1-PT3.
178                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-2.
179                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
180                 PRNT-1 (IND) ADD 1 TO IND.
181                 IF SWCH > 3 GO TO S1-PT4. MOVE 0 TO SWCH.
182                 IF IND > 60 MOVE 1 TO IND GO TO SEC-2. GO TO SEC-1.
183             S1-PT4.
184                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-2.
185                 MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
186                 PRNT-1 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
187                 IF IND > 60 MOVE 1 TO IND GO TO SEC-2. GO TO SEC-1.
188             SEC-11.
189                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
190                 MOVE HD-STOR TO PRNT-1 (IND)
191                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
192                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
193                 GO TO SEC-2A. GO TO SEC-1A.
194             SEC-2.
195                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S2-PT3.
196                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S2-PT4.
197                 IF SWCH > 1 GO TO S2-PT2.
198                 READ MRGTAP AT END PERFORM PRNT-RTN2.
199                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
200                 NUMSAV GO TO SEC-2A1.
201                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
202                 GO TO SEC-2A.
203             SEC-2A1.
204                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
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205                 GO TO SEC-33, GO TO SEC-22.
206             SEC-2A.
207                 MOVE XR-ONE TO COLL-STOR.
208                 MOVE NUM-STOR TO PRNT-2 (IND) ADD 1 TO IND.
209                 IF IND > 60 MOVE 1 TO IND GO TO SEC-3.  GO TO SEC-2.
210             S2-PT2.
211                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
212                 MOVE NUM-STOR TO PRNT-2 (IND) ADD 1 TO IND.
213                 IF SWCH > 2 GO TO S2-PT3, MOVE 0 TO SWCH.
214                 IF IND > 60 MOVE 1 TO IND GO TO SEC-3. GO TO SEC-2.
215             S2-PT3.
216                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-3.
217                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
218                 PRNT-2 (IND) ADD 1 TO IND.
219                 IF SWCH > 3 GO TO S2-PT4, MOVE 0 TO SWCH.
220                 IF IND > 60 MOVE 1 TO IND GO TO SEC-3. GO TO SEC-2.
221             S2-PT4.
222                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-3.
223                 MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
224                 PRNT-2 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
225                 IF IND > 60 MOVE 1 TO IND GO TO SEC-3. GO TO SEC-2.
226             SEC-22.
227                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
228                 MOVE HD-STOR TO PRNT-2 (IND)
229                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
230                 ADD 2 TO IND, IF IND > 60 MOVE 1 TO IND
231                 GO TO SEC-3A, GO TO SEC-2A.
232             SEC-3.
233                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S3-PT3,
234                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S3-PT4.
235                 IF SWCH > 1 GO TO S3-PT2.
236                 READ MRGTAP AT END PERFORM PRNT-RTN2.
237                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR  NUM2 IS NOT EQUAL TO
238                 NUMSAV GO TO SEC-3A1.
239                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
240                 GO TO SEC-3A.
241             SEC-3A1.
242                 ADD 2 TO IND, IF IND > 60 MOVE 1 TO IND
243                 GO TO SEC-44, GO TO SEC-33.
244             SEC-3A.
245                 MOVE XR-ONE TO COLL-STOR.
246                 MOVE NUM-STOR TO PRNT-3 (IND) ADD 1 TO IND.
247                 IF IND > 60 MOVE 1 TO IND GO TO SEC-4.  GO TO SEC-3.
248             S3-PT2.
249                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
250                 MOVE NUM-STOR TO PRNT-3 (IND) ADD 1 TO IND.
251                 IF SWCH > 2 GO TO S3-PT3, MOVE 0 TO SWCH.
252                 IF IND > 60 MOVE 1 TO IND GO TO SEC-4. GO TO SEC-3.
253             S3-PT3.
254                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-4.
255                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
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256                 PRNT-3 (IND) ADD 1 TO IND.
257                 IF SWCH > 3 GO TO S3-PT4. MOVE 0 TO SWCH.
258                 IF IND > 60 MOVE 1 TO IND GO TO SEC-4. GO TO SEC-3.
259           S3-PT4.
260                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-4.
261                 MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
262                 PRNT-3 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
263                 IF IND > 60 MOVE 1 TO IND GO TO SEC-4. GO TO SEC-3.
264           SEC-33.
265                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
266                 MOVE HD-STOR TO PRNT-3 (IND)
267                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
268                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
269                 GO TO SEC-4A. GO TO SEC-3A.
270           SEC-4.
271                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S4-PT3.
272                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S4-PT4.
273                 IF SWCH > 1 GO TO S4-PT2.
274                 READ MRGTAP AT END PERFORM PRNT-RTN2.
275                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
276                 NUMSAV GO TO SEC-4A1.
277                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
278                 GO TO SEC-4A.
279           SEC-4A1.
280                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
281                 GO TO SEC-55. GO TO SEC-44.
282           SEC-4A.
283                 MOVE XR-ONE TO COLL-STOR.
284                 MOVE NUM-STOR TO PRNT-4 (IND) ADD 1 TO IND.
285                 IF IND > 60 MOVE 1 TO IND GO TO SEC-5. GO TO SEC-4.
286           S4-PT2.
287                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
288                 MOVE NUM-STOR TO PRNT-4 (IND) ADD 1 TO IND.
289                 IF SWCH > 2 GO TO S4-PT3. MOVE 0 TO SWCH
290                 IF IND > 60 MOVE 1 TO IND GO TO SEC-5. GO TO SEC-4.
291           S4-PT3.
292                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-5.
293                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
294                 PRNT-4 (IND) ADD 1 TO IND.
295                 IF SWCH > 3 GO TO S4-PT4. MOVE 0 TO SWCH.
296                 IF IND > 60 MOVE 1 TO IND GO TO SEC-5. GO TO SEC-4.
297           S4-PT4.
298                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-5.
299                 MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
300                 PRNT-4 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
301                 IF IND > 60 MOVE 1 TO IND GO TO SEC-5. GO TO SEC-4.
302           SEC-44.
303                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
304                 MOVE HD-STOR TO PRNT-4 (IND)
305                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
306                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
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307                 GO TO SEC-5A, GO TO SEC-4A.
308           SEC-5.
309                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S5-PT3.
310                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S5-PT4.
311                 IF SWCH > 1 GO TO S5-PT2.
312                 READ MRGTAP AT END PERFORM PRNT-RTN2.
313                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
314                 NUMSAV GO TO SEC-5A1.
315                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
316                 GO TO SEC-5A.
317           SEC-5A1.
318                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
319                 GO TO SEC-66. GO TO SEC-55.
320           SEC-5A.
321                 MOVE XR-ONE TO COLL-STOR.
322                 MOVE NUM-STOR TO PRNT-5 (IND) ADD 1 TO IND.
323                 IF IND > 60 MOVE 1 TO IND GO TO SEC-6.  GO TO SEC-5.
324           S5-PT2.
325                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
326                 MOVE NUM-STOR TO PRNT-5 (IND) ADD 1 TO IND.
327                 IF SWCH > 2 GO TO S5-PT3. MOVE 0 TO SWCH.
328                 IF IND > 60 MOVE 1 TO IND GO TO SEC-6. GO TO SEC-5.
329           S5-PT3.
330                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-6.
331                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
332                 PRNT-5 (IND) ADD 1 TO IND.
333                 IF SWCH > 3 GO TO S5-PT4. MOVE 0 TO SWCH.
334                 IF IND > 60 MOVE 1 TO IND GO TO SEC-6. GO TO SEC-5.
335           S5-PT4.
336                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-6.
337                 MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
338                 PRNT-5 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
339                 IF IND > 60 MOVE 1 TO IND GO TO SEC-6. GO TO SEC-5.
340           SEC-55.
341                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
342                 MOVE HD-STOR TO PRNT-5 (IND)
343                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
344                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
345                 GO TO SEC-6A. GO TO SEC-5A.
346           SEC-6.
347                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S6-PT3.
348                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S6-PT4.
349                 IF SWCH > 1 GO TO S6-PT2.
350                 READ MRGTAP AT END PERFORM PRNT-RTN2.
351                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
352                 NUMSAV GO TO SEC-6A1.
353                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
354                 GO TO SEC-6A.
355           SEC-6A1.
356                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
357                 GO TO SEC-77. GO TO SEC-66.
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358             SEC-6A.
359                 MOVE XR-ONE TO COLL-STOR.
360                 MOVE NUM-STOR TO PRNT-6 (IND) ADD 1 TO IND.
361                 IF IND > 60 MOVE 1 TO IND GO TO SEC-7. GO TO SEC-6.
362             S6-PT2.
363                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
364                 MOVE NUM-STOR TO PRNT-6 (IND) ADD 1 TO IND.
365                 IF SWCH > 2 GO TO S6-PT3. MOVE 0 TO SWCH.
366                 IF IND > 60 MOVE 1 TO IND GO TO SEC-7. GO TO SEC-6.
367             S6-PT3.
368                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-7.
369                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
370                 PRNT-6 (IND) ADD 1 TO IND.
371                 IF SWCH > 3 GO TO S6-PT4. MOVE 0 TO SWCH.
372                 IF IND > 60 MOVE 1 TO IND GO TO SEC-7. GO TO SEC-6.
373             S6-PT4.
374                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-7.
375                 MOVE XR-FOUR TO COLL-STOR. MOVE NUM-STOR TO
376                 PRNT-6 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
377                 IF IND > 60 MOVE 1 TO IND GO TO SEC-7. GO TO SEC-6.
378             SEC-66.
379                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
380                 MOVE HD-STOR TO PRNT-6 (IND)
381                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
382                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
383                 GO TO SEC-7A. GO TO SEC-6A.
384             SEC-7.
385                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S7-PT3.
386                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S7-PT4.
387                 IF SWCH > 1 GO TO S7-PT2.
388                 READ MRGTAP AT END PERFORM PRNT-RTN2.
389                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
390                 NUMSAV GO TO SEC-7A1.
391                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
392                 GO TO SEC-7A.
393             SEC-7A1.
394                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
395                 GO TO SEC-88. GO TO SEC-77.
396             SEC-7A.
397                 MOVE XR-ONE TO COLL-STOR.
398                 MOVE NUM-STOR TO PRNT-7 (IND) ADD 1 TO IND.
399                 IF IND > 60 MOVE 1 TO IND GO TO SEC-8. GO TO SEC-7.
400             S7-PT2.
401                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
402                 MOVE NUM-STOR TO PRNT-7 (IND) ADD 1 TO IND.
403                 IF SWCH > 2 GO TO S7-PT3. MOVE 0 TO SWCH
404                 IF IND > 60 MOVE 1 TO IND GO TO SEC-8. GO TO SEC-7.
405             S7-PT3.
406                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-8.
407                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
408                 PRNT-7 (IND) ADD 1 TO IND.
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409                 IF SWCH > 3 GO TO S7-PT4. MOVE 0 TO SWCH.
410                 IF IND > 60 MOVE 1 TO IND GO TO SEC-8. GO TO SEC-7.
411           S7-PT4.
412                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-8.
413                 MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
414                 PRNT-7 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
415                 IF IND > 60 MOVE 1 TO IND GO TO SEC-8. GO TO SEC-7.
416           SEC-77.
417                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
418                 MOVE HD-STOR TO PRNT-7 (IND)
419                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
420                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
421                 GO TO SEC-8A. GO TO SEC-7A.
422           SEC-8.
423                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S8-PT3.
424                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S8-PT4.
425                 IF SWCH > 1 GO TO S8-PT2.
426                 READ MRGTAP AT END PERFORM PRNT-RTN2.
427                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
428                 NUMSAV GO TO SEC-8A1.
429                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
430                 GO TO SEC-8A.
431           SEC-8A1.
432                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
433                 GO TO SEC-9A. GO TO SEC-88.
434           SEC-8A.
435                 MOVE XR-ONE TO COLL-STOR.
436                 MOVE NUM-STOR TO PRNT-8 (IND) ADD 1 TO IND.
437                 IF IND > 60 MOVE 1 TO IND GO TO SEC-9. GO TO SEC-8.
438           S8-PT2.
439                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
440                 MOVE NUM-STOR TO PRNT-8 (IND) ADD 1 TO IND.
441                 IF SWCH > 2 GO TO S8-PT3. MOVE 0 TO SWCH.
442                 IF IND > 60 MOVE 1 TO IND GO TO SEC-9. GO TO SEC-8.
443           S8-PT3.
444                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-9.
445                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
446                 PRNT-8 (IND) ADD 1 TO IND.
447                 IF SWCH > 3 GO TO S8-PT4. MOVE 0 TO SWCH.
448                 IF IND > 60 MOVE 1 TO IND GO TO SEC-9. GO TO SEC-8.
449           S8-PT4.
450                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-9.
451                 MOVE XR-FOUR TO COLL-STOR. MOVE NUM-STOR TO
452                 PRNT-8 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
453                 IF IND > 60 MOVE 1 TO IND GO TO SEC-9. GO TO SEC-8.
454           SEC-88.
455                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
456                 MOVE HD-STOR TO PRNT-8 (IND)
457                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
458                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
459                 GO TO SEC-9A. GO TO SEC-8A.
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460             SEC-9.
461                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S9-PT3.
462                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S9-PT4.
463                 IF SWCH > 1 GO TO S9-PT2.
464                 READ MRGTAP AT END PERFORM PRNT-RTN2.
465                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
466                 NUMSAV GO TO SEC-9A1.
467                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
468                 GO TO SEC-9A.
469             SEC-9A1.
470                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
471                 GO TO SEC-1010. GO TO SEC-99.
472             SEC-9A.
473                 MOVE XR-ONE TO COLL-STOR.
474                 MOVE NUM-STOR TO PRNT-9 (IND) ADD 1 TO IND.
475                 IF IND > 60 MOVE 1 TO IND GO TO SEC-10. GO TO SEC-9.
476             S9-PT2.
477                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
478                 MOVE NUM-STOR TO PRNT-9 (IND) ADD 1 TO IND.
479                 IF SWCH > 2 GO TO S9-PT3. MOVE 0 TO SWCH.
480                 IF IND > 60 MOVE 1 TO IND GO TO SEC-10. GO TO SEC-9.
481             S9-PT3.
482                 IF IND > 60 MOVE 1 TO IND MOVE 3 TO SWCH-PT GO TO SEC-10.
483                 MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
484                 PRNT-9 (IND) ADD 1 TO IND.
485                 IF SWCH > 3 GO TO S9-PT4. MOVE 0 TO SWCH.
486                 IF IND > 60 MOVE 1 TO IND GO TO SEC-10. GO TO SEC-9.
487             S9-PT4.
488                 IF IND > 60 MOVE 1 TO IND MOVE 4 TO SWCH-PT GO TO SEC-10.
489                 MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
490                 PRNT-9 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
491                 IF IND > 60 MOVE 1 TO IND GO TO SEC-10. GO TO SEC-9.
492             SEC-99.
493                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
494                 MOVE HD-STOR TO PRNT-9 (IND)
495                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
496                 ADD 2 TO IND. IF IND > 60 MOVE 1 TO IND
497                 GO TO SEC-10A. GO TO SEC-9A.
498             SEC-10.
499                 IF SWCH-PT = 3 MOVE 0 TO SWCH-PT GO TO S10-PT3.
500                 IF SWCH-PT = 4 MOVE 0 TO SWCH-PT GO TO S10-PT4.
501                 IF SWCH > 1 GO TO S10-PT2.
502                 READ MRGTAP AT END PERFORM PRNT-RTN2.
503                 IF ALPH2 IS NOT EQUAL TO ALPHSAV OR NUM2 IS NOT EQUAL TO
504                 NUMSAV GO TO SEC-10A1.
505                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR.
506                 GO TO SEC-10A.
507             SEC-10A1.
508                 ADD 2 TO IND. IF IND > 60 PERFORM PRNT-RTN THRU GO-BACK
509                 GO TO SEC-11. GO TO SEC-1010.
510             SEC-10A.
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511                 MOVE XR-ONE TO COLL-STOR.
512                 MOVE NUM-STOR TO PRNT-10 (IND) ADD 1 TO IND.
513                 IF IND > 60 PERFORM PRNT-RTN THRU GO-BACK
514                 MOVE HD-STOR TO PRNT-1 (IND) ADD 2 TO IND
515                 GO TO SEC-1. GO TO SEC-10.
516           S10-PT2.
517                 MOVE SPACES TO NUM-STOR MOVE XR-TWO TO COLL-STOR
518                 MOVE NUM-STOR TO PRNT-10 (IND) ADD 1 TO IND.
519                 IF SWCH > 2 GO TO S10-PT3. MOVE 0 TO SWCH.
520                 IF IND > 60 PERFORM PRNT-RTN THRU GO-BACK GO TO RD-TAP.
521                 GO TO SEC-10.
522           S10-PT3.
523                 IF IND > 60 MOVE 3 TO SWCH-PT PERFORM PRNT-RTN THRU GO-BACK
524                 MOVE HD-STOR TO PRNT-1 (IND) ADD 2 TO IND
525                 GO TO SEC-1. MOVE XR-THREE TO COLL-STOR MOVE NUM-STOR TO
526                 PRNT-10 (IND) ADD 1 TO IND.
527                 IF SWCH > 3 GO TO S10-PT4. MOVE 0 TO SWCH.
528                 IF IND > 60 PERFORM PRNT-RTN THRU GO-BACK GO TO RD-TAP.
529                 GO TO SEC-10.
530           S10-PT4.
531                 IF IND > 60 MOVE 4 TO SWCH-PT PERFORM PRNT-RTN THRU GO-BACK
532                 MOVE HD-STOR TO PRNT-1 (IND) ADD 2 TO IND
533                 GO TO SEC-1. MOVE XR-FOUR TO COLL-STOR MOVE NUM-STOR TO
534                 PRNT-10 (IND) ADD 1 TO IND. MOVE 0 TO SWCH.
535                 IF IND > 60 PERFORM PRNT-RTN THRU GO-BACK GO TO RD-TAP.
536                 GO TO SEC-10.
537           SEC-10.
538                 MOVE NUM2 TO NUMSAV MOVE ALPH2 TO ALPHSAV PERFORM HEAD-IT
539                 MOVE HD-STOR TO PRNT-10 (IND)
540                 MOVE MAIN2 TO MAIN-STOR PERFORM COL-RNG THRU DUM-PAR
541                 ADD 2 TO IND. IF IND > 60 PERFORM PRNT-RTN THRU
542                 GO-BACK MOVE HD-STOR TO PRNT-1 (IND) ADD 2 TO IND
543                 GO TO SEC-1A. GO TO SEC-10A.
544           PRNT-RTN.
545                 MOVE 1 TO IND MOVE 1 TO INC MOVE SPACES TO PRINT-REC.
546           PRNT-EM.
547                 MOVE PRNT-1 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
548                 MOVE PRNT-2 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
549                 MOVE PRNT-3 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
550                 MOVE PRNT-4 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
551                 MOVE PRNT-5 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
552                 MOVE PRNT-6 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
553                 MOVE PRNT-7 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
554                 MOVE PRNT-8 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
555                 MOVE PRNT-9 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
556                 MOVE PRNT-10 (IND) TO PRNT-RC (INC) WRITE PRINT-REC AFTER
557                 ADVANCING 1 LINES ADD 1 TO IND.
558                 IF IND > 60 GO TO GO-BARK. MOVE 1 TO INC GO TO PRNT-EM.
559           GO-BARK.
560                 MOVE SPACES TO PRNT-ARA MOVE SPACES TO PRINT-REC MOVE 1 TO
561                 IND ADD 1 TO PAG-KNT. IF PAG-SWCH = 1 MOVE 0 TO PAG-SWCH
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562                 MOVE PAG-KNT TO PAG-PRTR MOVE 'PAGE ' TO PAG-HLDR
563                 WRITE PRINT-RECS AFTER ADVANCING 0 LINES MOVE SPACES TO
564                 PRINT-REC WRITE PRINT-REC AFTER ADVANCING 1 LINES
565                 GO TO GO-BACK.
566                 MOVE PAG-KNT TO PAG-PRT
567                 MOVE 'PAGE ' TO PAG-HLD WRITE PRINT-REC4
568                 AFTER ADVANCING 0 LINES MOVE SPACES TO PRINT-REC
569                 WRITE PRINT-REC AFTER ADVANCING 1 LINES
570                 MOVE 1 TO PAG-SWCH.
571             GO-BACK.
572                 MOVE SPACES TO PRINT-REC.
573             PRNT-RTN2.
574                 CLOSE MRGTAP.
575                 DISPLAY 'MOUNT NEXT MRG REEL-(REPLY Y OR N)' UPON CONSOLE.
576                 ACCEPT CNTRL-NO FROM CONSOLE.
577                 IF CNTRL-NO = 'N' GO TO PRNT-RTN3.
578                 OPEN INPUT MRGTAP.
579                 READ MRGTAP AT END GO TO FINI.
580             PRNT-RTN3.
581                 MOVE 1 TO IND MOVE 1 TO INC MOVE SPACES TO PRINT-REC.
582             PRNT-EM2.
583                 MOVE PRNT-1 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
584                 MOVE PRNT-2 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
585                 MOVE PRNT-3 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
586                 MOVE PRNT-4 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
587                 MOVE PRNT-5 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
588                 MOVE PRNT-6 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
589                 MOVE PRNT-7 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
590                 MOVE PRNT-8 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
591                 MOVE PRNT-9 (IND) TO PRNT-RC (INC) ADD 1 TO INC.
592                 MOVE PRNT-10 (IND) TO PRNT-RC (INC)
593                 WRITE PRINT-REC AFTER ADVANCING 1 LINES ADD 1 TO IND.
594                 IF IND > 60 GO TO FINI. MOVE 1 TO INC GO TO PRNT-EM2.
595             FINI.
596                 CLOSE PRINT-FILE STOP RUN.
597             COL-RNG.
598                 MOVE SPACES TO COL-ARAY MOVE SPACES TO COL-XR
599                 MOVE 1 TO AN1 MOVE 1 TO AN2 MOVE COLL2 TO COL-ARAY.
600             RNG-1.
601                 IF COLL4 (AN1) = ' ' MOVE 1 TO SWCH GO TO DUM-PAR.
602                 MOVE COLL4 (AN1) TO XR1 (AN2) ADD 1 TO AN1 ADD 1 TO AN2.
603                 IF AN2 > 5 MOVE 1 TO AN2 GO TO RNG-1A. GO TO RNG-1.
604             RNG-1A.
605                 IF COLL4 (AN1) = ' ' MOVE 1 TO SWCH GO TO DUM-PAR.
606             RNG-2.
607                 IF COLL4 (AN1) = ' ' MOVE 2 TO SWCH GO TO DUM-PAR.
608                 MOVE COLL4 (AN1) TO XR2 (AN2) ADD 1 TO AN1 ADD 1 TO AN2.
609                 IF AN2 > 5 MOVE 1 TO AN2 GO TO RNG-2A. GO TO RNG-2.
610             RNG-2A.
611                 IF COLL4 (AN1) = ' ' MOVE 2 TO SWCH GO TO DUM-PAR.
612             RNG-3.
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613                 IF COLL4 (AN1) = ' ' MOVE 3 TO SWCH GO TO DUM-PAR.
614                 MOVE COLL4 (AN1) TO XR3 (AN2) ADD 1 TO AN1 ADD 1 TO AN2.
615                 IF AN2 > 5 MOVE 1 TO AN2 GO TO RNG-3A.  GO TO RNG-3.
616           RNG-3A.
617                 IF COLL4 (AN1) = ' ' MOVE 3 TO SWCH GO TO DUM-PAR.
618           RNG-4.
619                 IF COLL4 (AN1) = ' ' MOVE 4 TO SWCH GO TO DUM-PAR.
620                 MOVE COLL4 (AN1) TO XR4 (AN2) ADD 1 TO AN1 ADD 1 TO AN2.
621                 IF AN2 > 5 GO TO DUM-PAR.  GO TO RNG-4.
622
623           DUM-PAR.
                    MOVE SPACES TO PRINT-REC.
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1           IDENTIFICATION DIVISION.
2           PROGRAM-ID. 'LNRTAB'.
3           ENVIRONMENT DIVISION.
4           INPUT-OUTPUT SECTION.
5           FILE-CONTROL.
6               SELECT LNRTAP ASSIGN TO 'SYS101' UTILITY M70-445.
7           DATA DIVISION.
8           FILE SECTION.
9           FD  LNRTAP RECORDING MODE IS F
10              LABEL RECORDS ARE OMITTED
11              BLOCK CONTAINS 400 RECORDS
12              DATA RECORD IS LNR-REC.
13          01  LNR-REC.
14              02  FILLER          PICTURE X(12).
15              02  COLL            PICTURE X.
16          WORKING-STORAGE SECTION.
17          77  TOT-KNT             PICTURE 9(8) VALUE 0.
18          77  IND                 PICTURE 99.
19          77  MIS-MACH            PICTURE 9(6) VALUE 0.
20          77  CNTRL-NO            PICTURE X.
21          01  COUNT-ARA.
22              02  TABR.
23                  03  FILLER      PICTURE X VALUE 'A'.
24                  03  FILLER      PICTURE X VALUE 'B'.
25                  03  FILLER      PICTURE X VALUE 'C'.
26                  03  FILLER      PICTURE X VALUE 'D'.
27                  03  FILLER      PICTURE X VALUE 'E'.
28                  03  FILLER      PICTURE X VALUE 'F'.
29                  03  FILLER      PICTURE X VALUE 'G'.
30                  03  FILLER      PICTURE X VALUE 'H'.
31                  03  FILLER      PICTURE X VALUE 'I'.
32                  03  FILLER      PICTURE X VALUE 'J'.
33                  03  FILLER      PICTURE X VALUE 'K'.
34                  03  FILLER      PICTURE X VALUE 'L'.
35                  03  FILLER      PICTURE X VALUE 'M'.
36                  03  FILLER      PICTURE X VALUE 'N'.
37                  03  FILLER      PICTURE X VALUE 'O'.
38                  03  FILLER      PICTURE X VALUE 'P'.
39                  03  FILLER      PICTURE X VALUE 'Q'.
40                  03  FILLER      PICTURE X VALUE 'R'.
41                  03  FILLER      PICTURE X VALUE 'S'.
42                  03  FILLER      PICTURE X VALUE 'T'.
43                  03  FILLER      PICTURE X VALUE 'U'.
44                  03  FILLER      PICTURE X VALUE 'V'.
45                  03  FILLER      PICTURE X VALUE 'W'.
46                  03  FILLER      PICTURE X VALUE 'X'.
47                  03  FILLER      PICTURE X VALUE 'Y'.
48                  03  FILLER      PICTURE X VALUE 'Z'.
49              02  TAB  REDEFINES TABR PICTURE X OCCURS 26 TIMES.
50          01  TAB-KNT.
51              02  COL-SUM         PICTURE 9(6) OCCURS 26 TIMES.
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52          PROCEDURE DIVISION.
53              OPEN INPUT LNRTAP MOVE ZEROES TO TAB-KNT MOVE 1 TO IND.
54          RD-TAP.
55              READ LNRTAP AT END GO TO FINI. ADD 1 TO TOT-KNT.
56          CHK-EM.
57              IF COLL = TAB (IND) ADD 1 TO COL-SUM (IND)
58              MOVE 1 TO IND GO TO RD-TAP.
59              ADD 1 TO IND. IF IND > 26 ADD 1 TO MIS-MACH
60              MOVE 1 TO IND GO TO RD-TAP. GO TO CHK-EM.
61          FINI.
62              CLOSE LNRTAP.
63              DISPLAY 'MOUNT NEXT REEL - (REPLY Y OR N)' UPON CONSOLE.
64              ACCEPT CNTRL-NO FROM CONSOLE.
65              IF CNTRL-NO = 'N' GO TO FIN-ALL.
66              OPEN INPUT LNRTAP GO TO RD-TAP.
67          FIN-ALL.
68              PERFORM FIN-1 VARYING IND FROM 1 BY 1 UNTIL IND > 26.
69              GO TO FIN-2.
70          FIN-1.
71              DISPLAY '    ' TAB (IND) '    ' COL-SUM (IND) .
72          FIN-2.
73              DISPLAY 'TOTAL RECORD COUNT  =  ' TOT-KNT.
74              DISPLAY 'NO MATCH COUNT = ' MIS-MACH.
75              STOP RUN.
```

LNRSRT - This COBOL sort could be used by an installation that does not have access to a utility disk sort. This program sorts the records on the LNR data tape in ascending order of numeric prefix, alphabetic prefix, serial number, and location code. The sorted records are re-written onto the LNR data tape.

The program requires 4 tape drives.

Console Messages and Replies:

MSG-	ASSGN SYS246
REPLY-	(assign to work tape-1)
MSG-	ASSGN SYS247
REPLY-	(assign to work tape-2)
MSG-	ASSGN SYS248
REPLY-	(assign to work tape-3)
MSG-	ASSGN SYS100
REPLY-	(assign LNR data tape)

LNRSTP - This program deletes all duplicate records from the LNR data tape. The unique records are written onto a work tape and then transferred back to the LNR data tape. A count of the records on the LNR data tape prior to deletion and after deletion is displayed upon the console.

The program requires two tape drives.

Console Messages and Replies:

MSG-	ASSGN SYS101
REPLY-	(assign LNR data tape)
MSG-	ASSGN SYS102
REPLY-	(assign to work tape)

LNRLST - This is the main program in the LNR system. LNRLST uses the input records from the LNR data tape and merges all records having the same LC number but different location codes into one record containing that LC number and all corresponding location codes. These records are written onto a work tape. This tape file of merged records is used as input to the print-file wherein the LNR is produced.

This program allows for the use of more than one reel of LNR data and for the creation of more than one reel of merged record tapes. A reply of Y or N is given on the console in response to messages to mount multiple reels.

The program requires two tape drives and one printer.

Console Messages and Replies:

MSG-	ASSGN SYS101
REPLY-	(assign LNR data tape)
MSG-	ASSGN SYS102
REPLY-	(assign work tape)
MSG-	ASSGN SYSLST
REPLY-	(assign printer)

LNRTAB - This program is used to count the number of volumes on the LNR data tape contributed by each member.

Each member's location code and volume count is displayed on the printer.

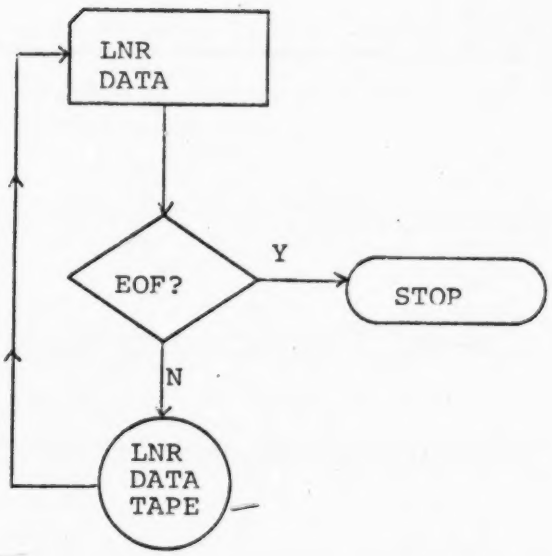
The program is designed to accept a multi-volume file by replying Y to the message of "MOUNT NEXT REEL" on the console.

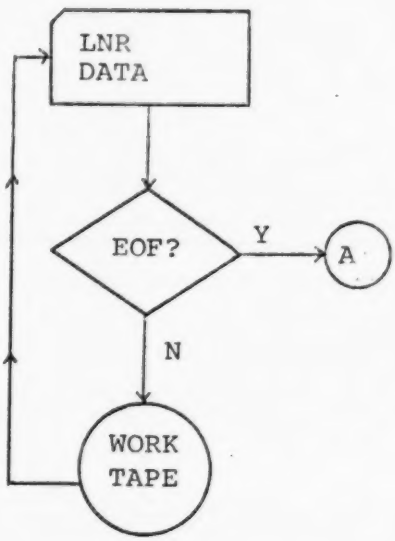
This program requires one tape drive.

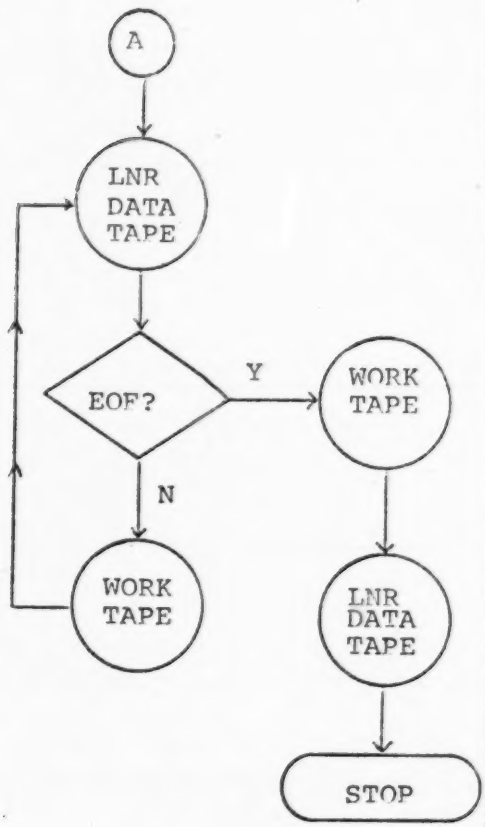
Console Messages and Replies:

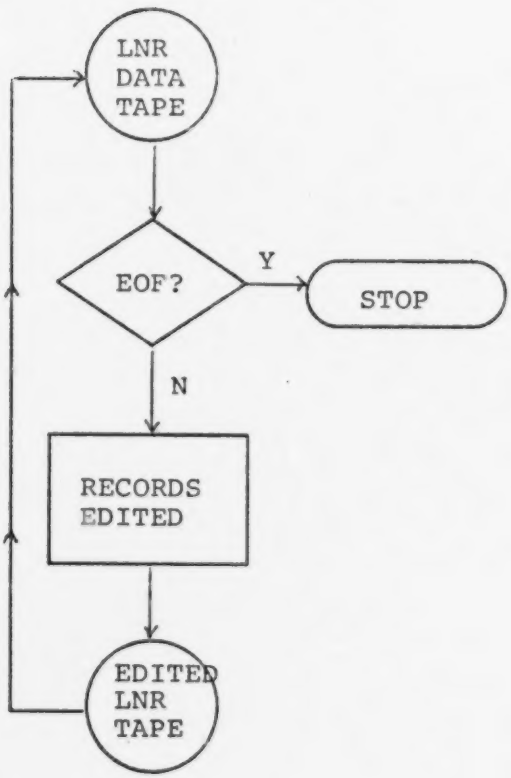
MSG-	ASSGN SYS101
REPLY-	(assign LNR data tape)

SYSTEM FLOW CHARTS; SAMPLE OUTPUT

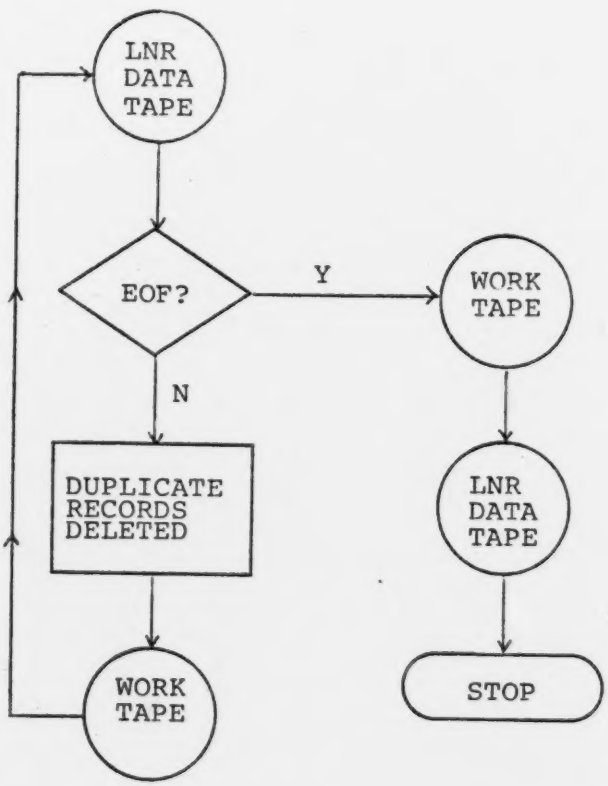

LNR
DATA
EOF?
Y
STOP
N
LNR
DATA
TAPE

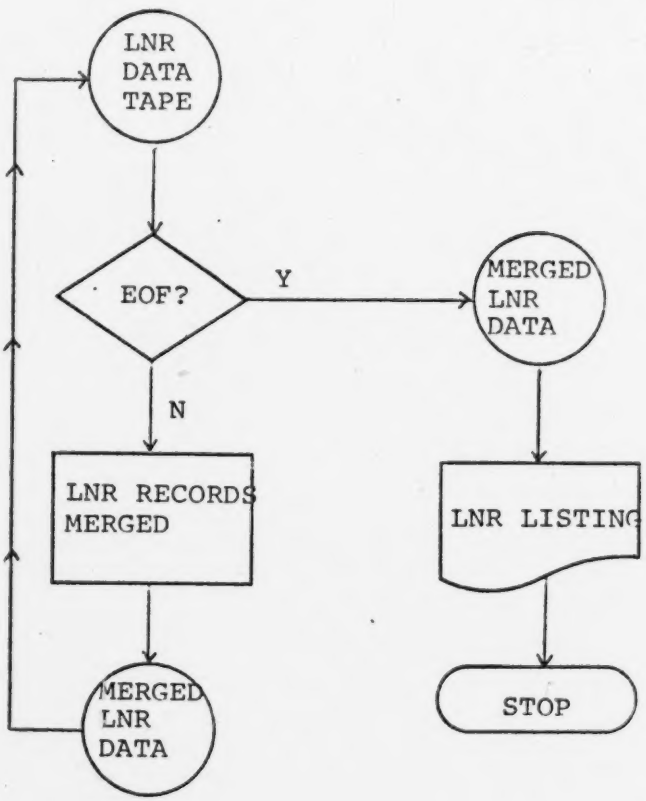

LNR
DATA
EOF?
Y
A
N
WORK
TAPE

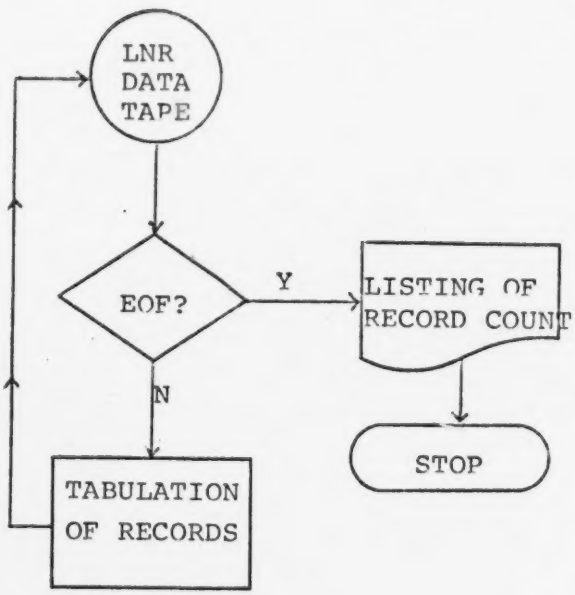

A
LNR
DATA
TAPE
EOF?
Y
WORK
TAPE
N
WORK
TAPE
LNR
DATA
TAPE
STOP


LNR
DATA
TAPE
EOF?
Y
STOP
N
RECORDS
EDITED
EDITED
LNR
TAPE

LNR
DATA
TAPE
SORT
SORTED
LNR
TAPE


LNR
DATA
TAPE
EOF?
Y
WORK
TAPE
N
DUPLICATE
RECORDS
DELETED
LNR
DATA
TAPE
WORK
TAPE
STOP


LNR
DATA
TAPE
EOF?
Y
N
MERGED
LNR
DATA
LNR RECORDS
MERGED
LNR LISTING
MERGED
LNR
DATA
STOP


LNR
DATA
TAPE
EOF?
Y
LISTING OF
RECORD COUNT
N
STOP
TABULATION
OF RECORDS

APPENDIX II

Sample output for LNRLST

```
                                                
```

APPENDIX I

Sample output for LNRTAB

A	138745
B	C89344
C	154510
D	C05942
E	306852
F	C00651
G	C01606
H	C08616
I	C48721
J	C10959
K	C00565
L	C51162
M	C80865
N	C05076
O	C56950
P	C06481
Q	C02271
R	C18894
S	C00000
T	C00000
U	C16942
V	C00000
W	C00000
X	C10190
Y	C00000
Z	C90992

TOTAL RECORD COUNT = 01106334
NO MATCH COUNT = 000000

LNR: NUMERICAL REGISTER OF BOOKS IN LOUISIANA LIBRARIES

LNR: NUMERICAL REGISTER OF BOOKS IN LOUISIANA LIBRARIES

Compiled for the Louisiana Library Association

At the University of Southwestern Louisiana

WILLIAM E. MCGRATH
Project Director

DONALD J. SIMON
Systems Analyst

First computer output Microfiche Edition

Supported in part by Library Services and Construction Act
Title III funds administered by the Louisiana State Library

LAFAYETTE, LOUISIANA
November, 1972

LLA COMMITTEE FOR A UNION CATALOG OF LIBRARY OF CONGRESS CARD NUMBERS

Mr. Sam Dyson, Louisiana Tech University, Chairman, 1971/72
Dr. Gerald Eberle, Louisiana State University, New Orleans
Mrs. Jane Kleiner, Louisiana State University, Baton Rouge
Mr. William E. McGrath, University of Southwestern Louisiana
Mr. Charles Miller, Tulane University, New Orleans
Mrs. Elizabeth Roundtree, Louisiana State Library
Mr. Donald J. Simon, University of Southwestern Louisiana
Mrs. Hester Slocum, New Orleans Public Library
Mr. Ronald Tumey, Rapides Parish Library, Alexandria

Table I

LIBRARY CODE	LIBRARY	VOLUMES CONTRIBUTED	PERIOD
E	Louisiana State University, Baton Rouge	306,852	R and C
C	University of Southwestern Louisiana, Lafayette	154,510	R and C
A	Louisiana State Library, Baton Rouge	138,745	R and C
Z	New Orleans Public Library, New Orleans	90,992	R and C
B	Louisiana Tech University, Ruston	89,344	R and C
M	Loyola University, New Orleans	80,865	R and C
O	Louisiana State University, New Orleans	56,950	R and C
L	Northeast Louisiana University, Monroe	51,162	R and C
I	Louisiana State University, Alexandria	48,721	R and C
R	St. Mary's Dominican College, New Orleans	18,894	R and C
U	Louisiana State University, Eunice	16,942	R and C
J	Southeastern Louisiana College, Hammond	10,959	C
X	Xavier University, New Orleans	10,190	C
H	Centenary College, Shreveport	8,616	C
P	Nicholls State University, Thibodeaux	6,481	C
D	Tulane University, New Orleans	5,942	C
N	Louisiana State University, Shreveport	5,076	C
Q	Louisiana College, Pineville	2,271	C
G	Grambling College, Grambling	1,606	-
F	Louisiana State University Medical School, ~~Shreveport~~ New Orleans	651	-
K	Northwestern State University, Natchitoches	565	
	Total	1,106,334**	

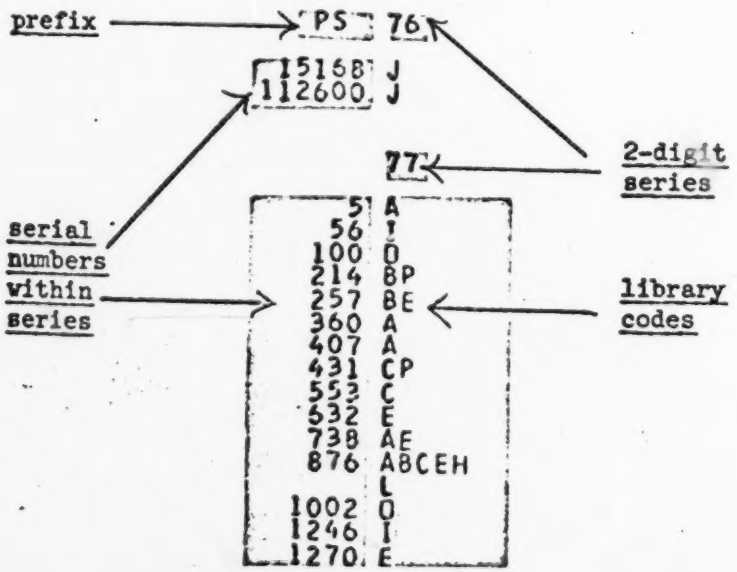
* Libraries are in rank order according to their contributions, not according to their holdings.
** That is 1,106,334 copies of 560,413 titles, or 1.97 copies per title.
R: Retrospective; C: Current

INTRODUCTION TO THE FIRST EDITION

This register contains locations for 548,290 books in 16 Louisiana libraries. The books are identified solely by the LC number or the NUC number . The register is by no means complete. It is estimated that books with LC numbers represent from 60 to 95% of a library's total books. Only three libraries—the State Library, the University of Southwestern Louisiana and Louisiana State University—Alexandria have contributed their complete retrospective LC numbers. "Retrospective" means all holding dating back to early acquisitions. Most of the libraries have been contributing their current acquisitions since November of 1969. The others have been contributing their acquisitions for about one year.

Participating libraries are ranked below in decending order of size of their contributions (not the size of their holdings). The libraries are listed in theis matter because of an informal agreement that borrowing libraries would always request a book from the smallest library if more than one library held a copy, thus relieving the larger libraries of some of the interlibrary loan burden.

Note that each library is designated by a single letter to the right of each LC number. If more than 5 libraries hold a volume, the letters are continued on to the next line below (for example):



In the example, six libraries hold the book designated 77-876. The numbers are arranged in numerical sequence by the first two digets, indicating the year and later the 70 series, then by the serial number within the year. Numbers with prefixes follow those without orefixes.

The register is not a bibliography. When a library wants to borrow a book from another library it should already have the bibliographic data in hand. Presumably the librarian has verified the bibliographic information from such sources as NUC or CBI or Publishers Weekly, and has jotted down the LC number. She then merely looks up the LC number in the register to determine a location.

The Register, in part, supplements the Louisiana Union Catalog which contains many titles which have no LC number. Eventually another 1,000,000 retrospective numbers will be compiled by the original participants and others not in this list. The larger list will not be printed. Instead it will be converted directly to microfiche which will be easily up-datable as the catalog grows with current acquisitions.

William E. McGrath
Lafayette, Louisiana
August 5, 1971

INTRODUCTION TO THE FIRST COMPUTER OUTPUT MICROFICHE EDITION (COM)

This new edition of the LNR contains locations for 1,106,334 copies of 560,413 titles in 21 libraries. Five libraries have been added since the first printed edition. It includes all of the volumes in the original, plus another one-half million. Data collection and computer work was funded by a second grant of $12,000 from LSCA funds administered by the Louisiana State Library.

Computer output micrfiche offers an inexpensive and convenient means for reproducing a large amount of tape-formatted data. It is ideally suited for the LNR where sustained reading is not required. Purchase of a reader is likely to be the largest initial expense.

Each page of the fiche contains as much information as the full printed page. The format is identical to the original printed edition. The fiche requires a reader with either 24X or 42X lens, and is available in microfilm as well as fiche.

A page index appears in the lower right hand corner of each fiche. An LC number can be located first by noting on each fiche the full-sized conventional image of the first LC number to appear on each fiche. The index refers to the LC number appearing on each page so that one merely notes from the index which LC number immediately precedes the one being looked up. The page index in turn is keyed to a full-size matrix index on the front of the microfiche reader.* To find a book represented by the LC card number 77-876, one notes that it would appear on the fiche with the number 68-12047 on the heading. A portion of the index is shown below. Here one notes that the number 77-876 would appear on the page beginning with the number 76-577851. The page is referenced by the coordinate K10 with the mechanical pointer.

It is estimated that the addition of retrospective holdings of other major Louisiana libraries will bring the total data base to 2,000,000 volumes. Subsequent cumulations will also be issued on COM and pervious cumulations may be discarded.

William E. McGrath
Donald J. Simon
Lafayette, Louisiana
November, 1972

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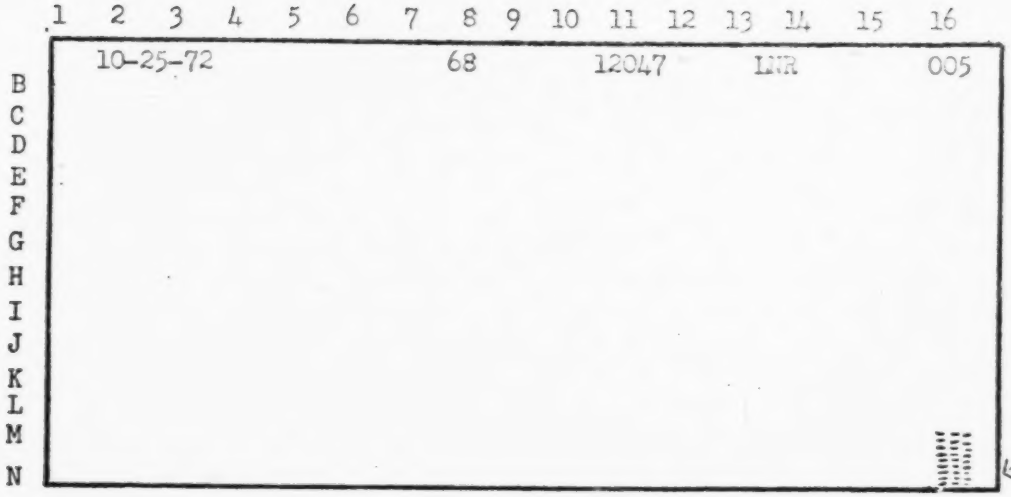
* The reader used here is: A Micro Design, Inc. C.O.M. 150 reader with an MDI-110 index plate from Kalvar Corporation, KAL/COM Division, Computer Output Microfilm, 2400 No. Causeway Blvd., Metairie, Louisiana 70001. $169.00.

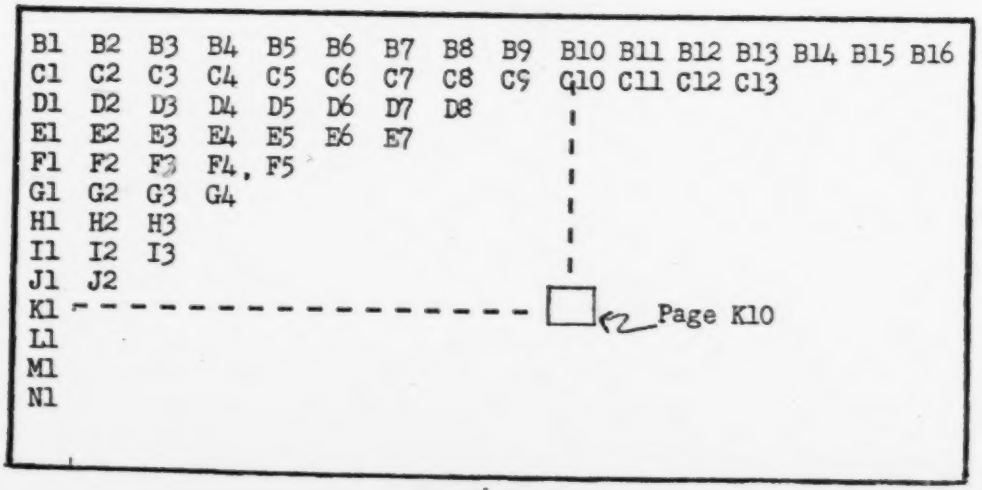


FICHE

PG	INDEX KEY	
F10	76	108407
G10	76	121920
H10	76	138295
I10	76	158495
J10	76	373344
K10	76	577851
L10	77	8456
M10	77	80919
N10	77	9266
B11	77	118134
C11	77	104942
D11	77	134012

LC Number 77-876 will be found on the page with the coordinates K10.

PORTION OF INDEX


B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13
D1 D2 D3 D4 D5 D6 D7 D8
E1 E2 E3 E4 E5 E6 E7
F1 F2 F3 F4, F5
G1 G2 G3 G4
H1 H2 H3
I1 I2 I3
J1 J2
K1
L1
M1
N1
Page K10
Mechanical pointer automatically locates correct page on fiche.

INDEX PLATE